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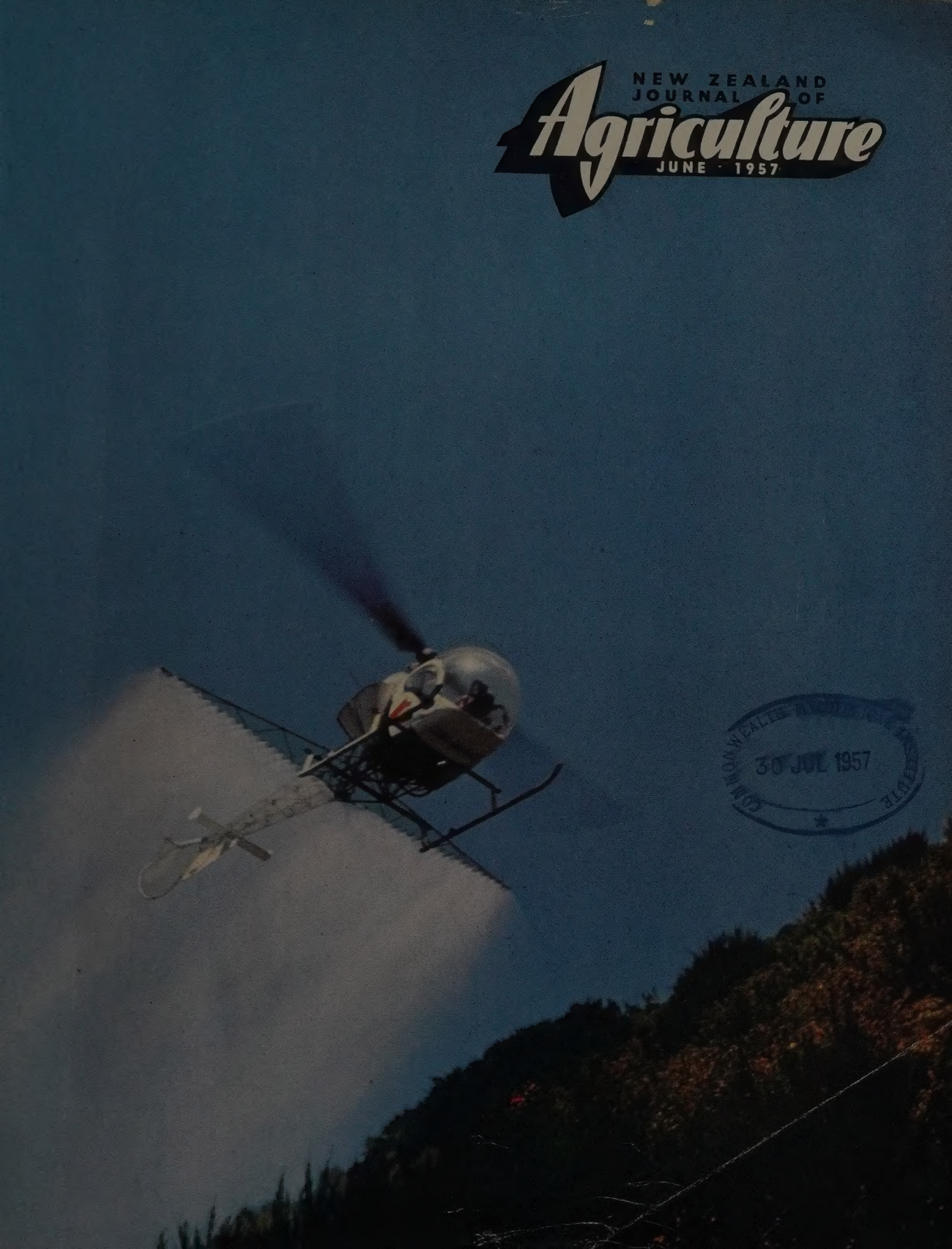

COMMONWEALTH AGRICULTURAL BUREAUX
30 JUL 1957

Cooper News

FARM BULLETIN published by COOPER, McDOUGALL & ROBERTSON (N.Z.) LTD.
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This Month's Cover

With the rapid development of agricultural aviation it was obvious that for work in rugged and broken terrain there would be a place for the helicopter. Its manoeuvrability and ability to fly at very low speeds and altitudes, the operator's excellent field of view, and its need of only a small clear area instead of a full-scale airstrip from which to operate are advantages that encourage its use where orthodox fixed-wing aircraft would be handicapped. In spraying for weed control, as in the cover illustration, closeness of the machine to the ground minimises evaporation, and downward turbulence created by the rotor blades assists distribution and penetration of spray. National Publicity Studios photograph.

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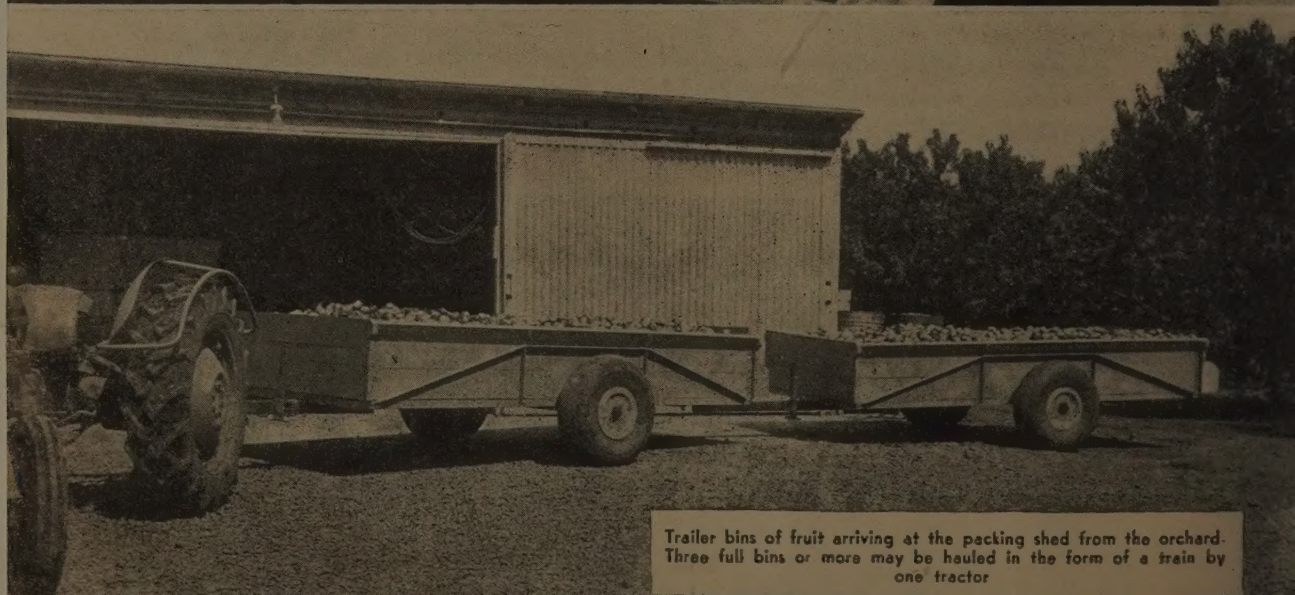
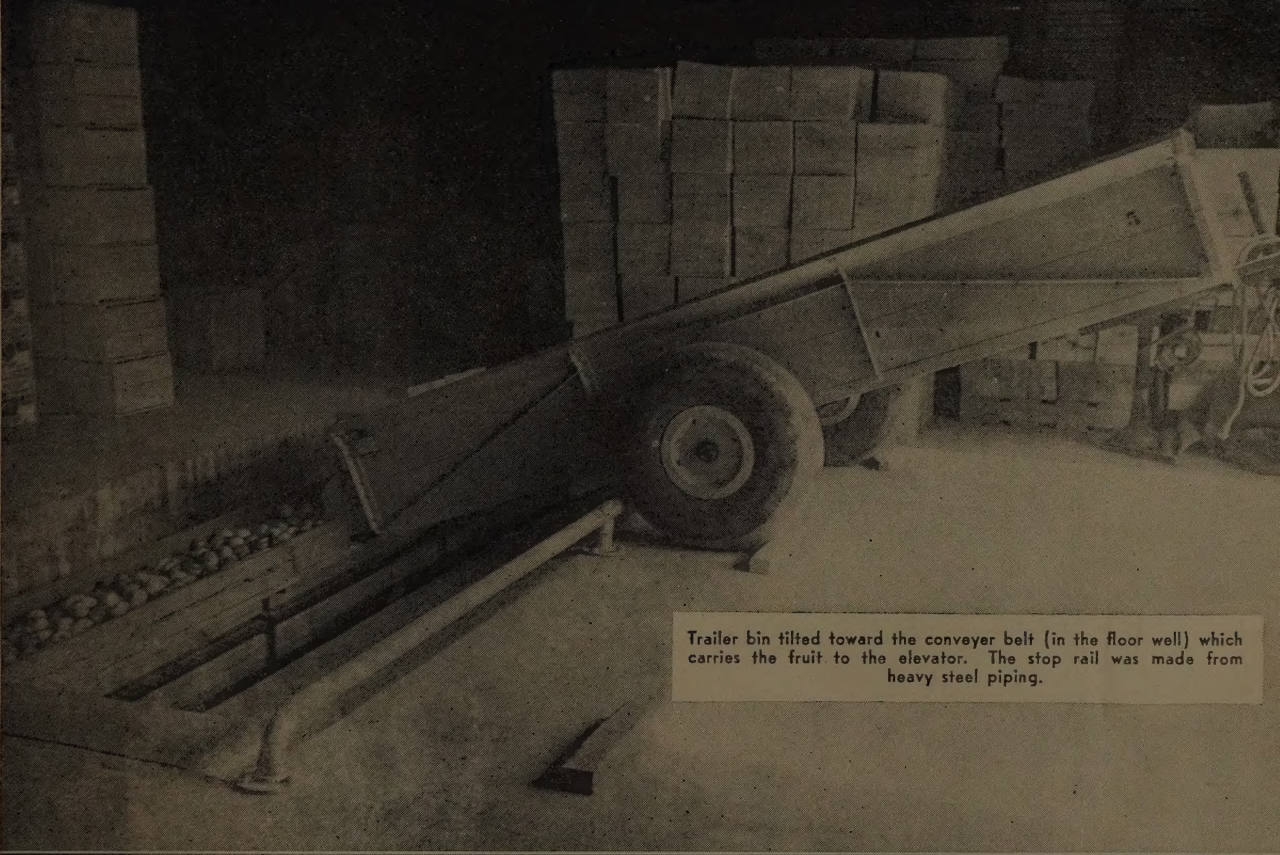
Developments in Mechanical and Bulk Handling of Fruit

RISING costs of production and the desire among those in the fruit industry not only to modernise their methods but to take full advantage of mechanical developments have inevitably led to new trends. A fairly recent development in New Zealand orchards, bulk handling systems, of which there are various types, have obviously found a permanent place in orchard management. They are proving quite satisfactory and a big advance in almost every way over earlier methods of fruit handling. In this article T. Conway, Instructor in Horticulture, Department of Agriculture, Hastings, describes developments in mechanical and bulk handling of fruit which have taken place over the last 4 to 5 years.

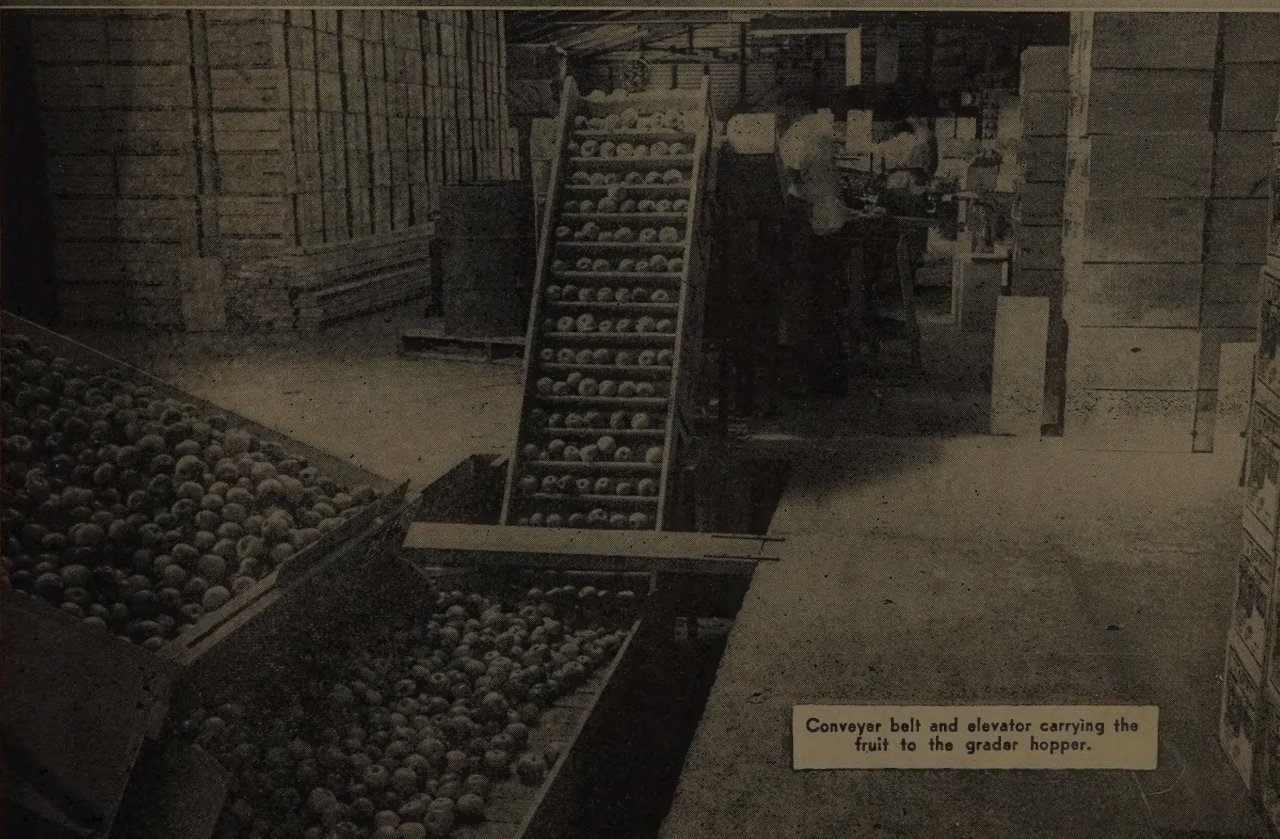
Emptying a picking bag into a trailer bin. This type holds about 90 loose bushels of fruit.



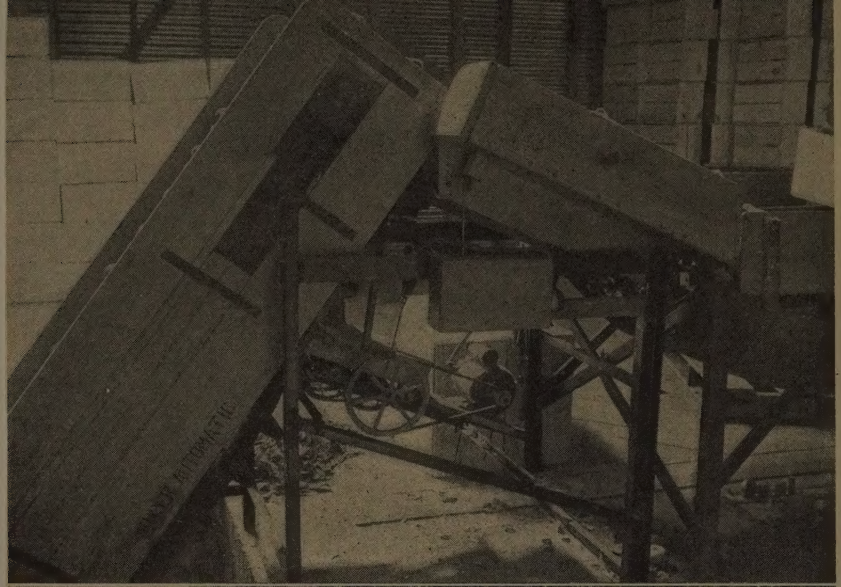
Trailer bins of fruit arriving at the packing shed from the orchard. Three full bins or more may be hauled in the form of a train by one tractor



Trailer bin tilted toward the conveyer belt (in the floor well) which carries the fruit to the elevator. The stop rail was made from heavy steel piping.



Conveyer belt and elevator carrying the fruit to the grader hopper.



To attain the ideal in the harvesting of pip fruit, under present conditions, the fruit must be picked at a stage of maturity to ensure that it has best edible quality and is handled in such a way that its quality is maintained during handling and storage. At the same time costs must be kept as low as possible. Very careful timing

← Side view of elevator and hopper. A mercury control switch in a small box beneath the hopper automatically controls the flow of fruit to the hopper by shutting off the conveyer belt and elevator as required.

and organisation of operations are required, especially where fairly large or quick-maturing lines of one variety are handled or where a number of varieties that mature in close succession is harvested.

Most orchards are fairly well organised and equipped. However, even in the best-operated orchards, bulk handling and other mechanical developments must receive the close attention of progressive growers.

Bulk handling systems eliminate the use of picking boxes—alone a big saving in time and effort—both in the orchard and the packing shed. Further, the use of fork lifts allows the packed fruit to be loaded out from the packing shed on pallets. This eliminates manhandling of individual cases as motor trucks are loaded or unloaded, and in

← Front and rear of trailers. At the rear of the trailer at right are the sliding boards removed when the trailer is tipped toward the conveyer belt in the shed.

addition the risk of bruising is very much reduced.

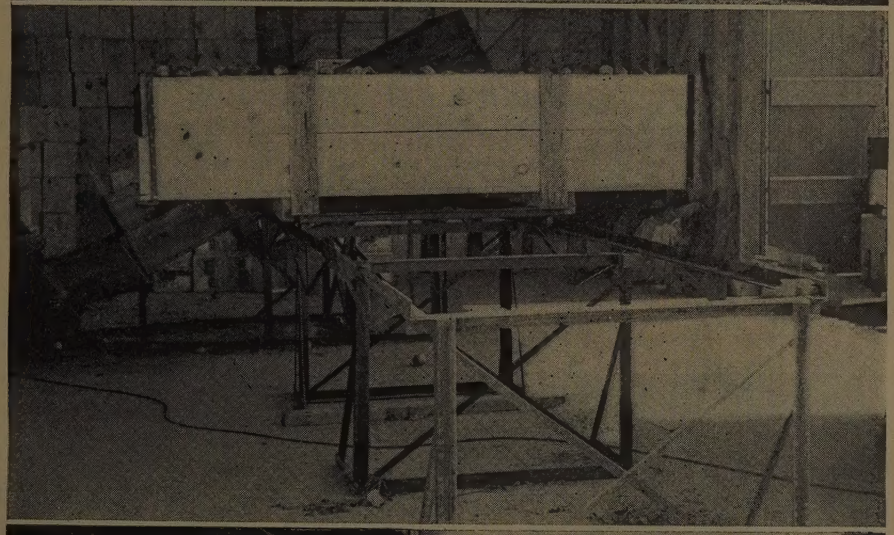
Considerable improvements have been made in bulk handling equipment since the early, largely experimental forms were introduced. Progress has been made largely through the pooling of ideas among growers. It has been pleasing to see how ready growers have been to accept and make worthwhile suggestions for improvements.

As a result the latest equipment is very practical, efficient, economical to operate, and generally well designed and constructed.

Bulk handling of fruit was pioneered in the Nelson and Hawke's Bay districts and has been adopted widely there in the last 2 years, mainly because of the extent and predominance of pip fruits in orchards in these areas. However, there is some indecision among some growers about new installations because of the extent to which loose-packed fruit will be required by the New Zealand Apple and Pear Marketing Board for prepackaging in plastic bags and the

← Trailer with cover to protect fruit from adverse weather, lengthwise dividing boards, and provision for quarter-section dividing boards to allow individual tallying for contract pickers.

Front and rear fork lifts each carrying a bin of fruit from the orchard. Each bin contains 40 loose bushels or more. The rear lift is very limited and suitable only for carrying bins. The rear bin is lowered to the ground and picked up by the front lift for placing on the conveyer in the packing shed. The front wheels of the tractor are fitted with oversize tyres. A compensating concrete mould is carried on a pallet on the rear lift when a filled bin or other heavy load is carried on the front lift only. This mould is filled with gravel to the extent needed. The pallet is simply dispensed with when not required.



Wide, steel roller conveyer which carries the bins shown on the tractor above to the elevator. Each bin rests on a separate steel frame which runs on steel wheels along the angle iron rails.

The method used in tilting the bin toward the hopper and elevator. The section of the conveyer opposite the hopper is set slightly off centre and is controlled by a knee-action support as required.

likely trend toward the establishment of central packing sheds.

It will probably be a number of years before much progress is made with central packing sheds, however, and meanwhile export fruit must be packed in orchards.

Main Types Used

The type of bulk handling equipment selected by an orchardist usually depends mainly on size of orchard, kind of fruit grown, available capital, shed space, equipment already on hand (such as a fork lift), and future expansion of production. Some aspects of management, such as use of contract harvesting, also have to be considered.

Of the systems so far operated in Hawke's Bay, the main interest is centred on three types:—

1. A large-capacity elevator type, involving a long concrete well in the packing shed floor in conjunction with a conveyer belt and elevator and a number of large trailer bins.
2. Bins transported and operated by a tractor lift which places them on a tilting frame, which replaces the usual grader hopper.
3. An elevator used in conjunction with a number of bins, carried from the orchard by a fork lift attached to a tractor, and a wide type of steel conveyer to carry the bins to the elevator.

With the last two types the bins are usually carried from the orchard on fork lifts on tractors, but growers who prefer them, especially for long hauls, can use flat-top trailers for carrying the bins.

Description of Types

Broadly the structure and operation of each of the three types are as follows:—

Type 1

The basic equipment with the Type 1 system is commercially produced and has been widely used in Nelson and Hawke's Bay.

A felt-lined elevator about 18in. wide replaces the normal grader hopper and lies at a slight angle toward the end of the grader. A more recent development is a vertical elevator, the main advantage being a slight saving in shed space. Between the elevator and the grading bench is placed a small hopper which reacts to the weight of fruit being held. As this hopper empties it springs slightly upward at the elevator end and this causes a mercury switch to start the electric motor of the elevator. When the hopper is full of fruit the mercury control stops the elevator moving, thereby regulating the flow of fruit to the grading bench.

The base of the elevator is sunk into the end of a long concrete well in the floor of the shed running in the same direction as the grader but extending from the hopper end away from the grader. This well may be 9½ft. to 15ft. long, 4½ft. wide, and 2ft. 3in. deep, with the side facing the shed doors sharply bevelled. Along this well travels a flat, 1ft. 6in.-wide rubber conveyer belt on a special wooden frame 2ft. 9in. wide. When in motion this belt moves slowly toward the elevator.

The fruit is harvested in large trailer bins fitted with aircraft-type wheels and tyres drawn by tractors. For distant travel on large orchards three bins at a time may be drawn by one tractor. Various sizes of bins have been tried, but the latest type holds upward of 100 loose bushels of apples or pears. Bins are made of timber attached to prefabricated steel frames, the measurements being 11ft. 9in. x 5ft. 6in. x 20in. deep. Some growers line the bottoms with linoleum to avoid chafing of the fruit and to allow the free movement of the fruit when tipped, but provided the timber is free of knots, well dressed, and well painted a liner such as linoleum does not seem necessary.

Usually two full bins are backed into the shed at right angles to the well, one alongside the other, until they reach a stop rail near the well. The trailer is released from the tractor once the drawbar stand of the trailer is lowered.

One of the bins is then tilted toward the conveyer belt in the well by a rope

▼ Another type of trailer, with steel frame only (16ft. long) to carry two large (8ft.) bins placed end to end. Bins are removed by a fork-lift truck, which has a clear approach on each side of the trailer wheels.

and pulley fixed to the rafters above the drawbar, the tail of the bin resting on a sloping board near the conveyer belt. Sufficient sliding boards are removed from the end of the bin to allow the fruit to slide out on to the belt.

As the electric motor for the equipment is switched on the fruit is carried slowly along on the belt to the elevator, which picks the fruit up and carries it upward to the grading control hopper and grading bench. The fruit slides rather than rolls from the bins to the belt. Before a replacement bin is put in position the second bin is put into operation, and there is no need for the flow of fruit to stop at any stage.

From 8 to 15 trailer bins are normally used with this equipment on large orchards. However, more may be needed to provide a good reserve and continuous flow of fruit and to avoid holding up the work of pickers during good weather and packers during wet weather.

The equipment described operates very smoothly and effectively, and so far there appears to be less bruising than with normal methods. A brief survey of handling time showed that 1000 cases of fruit could be handled with this equipment from the tree (including picking) to readiness for final outloading in about 143 man-hours. The same work done by normal methods without bulk handling equipment took 230 to 385 man-hours. A notable difference was in carting to the packing shed from the orchard, where with the bins 1000 cases of fruit were handled in 3 man-hours compared with 10 to 20 man-hours with the other method.

After packing, the fruit is stacked on pallets (35 cases to one pallet) and then outloaded to motor trucks by a standard commercial fork-lift truck or by a fork lift attached to the front or rear of a tractor. The fork-lift attachment is operated by a ram connected to the hydraulic equipment of the tractor. They are patented designs, but admirably suited to bulk handling and many other orchard tasks.

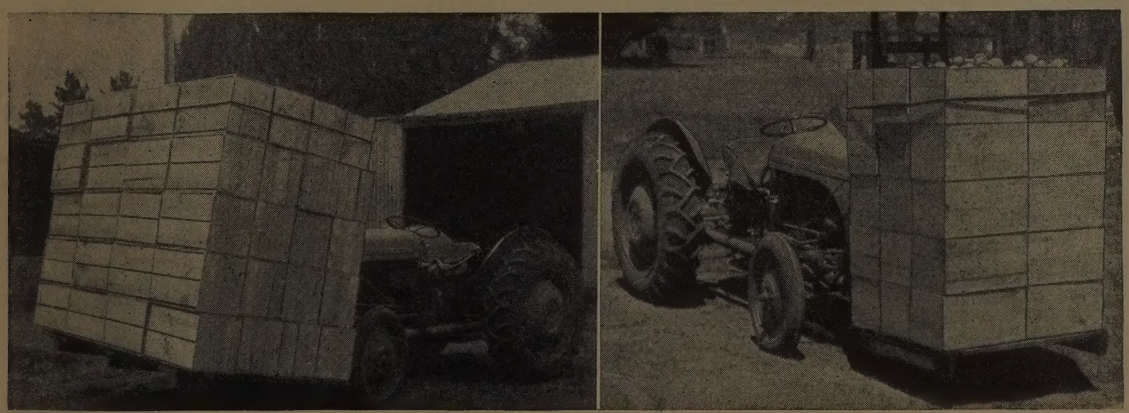
Fork-lift attachment on tractor. It is capable of lifting a full pallet of 35 bushels of fruit or its equivalent of loose fruit in large bins.

If shed space is limited, covers may be needed to protect the fruit in reserve trailers awaiting handling, and trailers should preferably be left under the shade of large trees close to the packing shed.

In some installations of this type where sheds are not long enough to take the well directly at the end of the grader and running in the same direction as the grader, a lean-to has been built on the side of the shed and the concrete well run in at right angles to the grader. With this arrangement the elevator and control hopper have to be fitted to the side of the grader. The lean-to is open ended and single trailers may be backed up to the well on either side.

Type 2

The Type 2 installation is simpler and much cheaper than Type 1. A tractor lift is used to carry smaller bins (containing 35 to 40 loose bushels) without wheels from the orchard to the shed and place them on a tilting wooden frame which replaces the grader hopper.



A load of empty cases being transported to pickers by a fork-lift attachment on a tractor (left) and a pallet of freshly picked apples being carried to the packing shed (right).

Reserve stock of full bins stacked in packing shed awaiting grading and packing. As required each bin is carried to and lowered on to a fixed wooden stand with a sloping top frame by the fork-lift truck. The bin then rests in a tilted position to allow the fruit to move on to the grader. Fork lifts on tractors can also be used for handling bins in the packing shed.

This fixed frame (in one orchard hydraulically elevated) is made of heavy timber with the top stand sloping toward the grader bench at an angle of about 35 degrees. After a full bin is lowered on to the frame sliding boards are removed from the end of the bin nearest the grader bench and the fruit slides as required on to the grader.

The flow of fruit is largely controlled by the number of boards removed. Alternatively, a hinged board can be fitted and lifted outward and upward. These bins are usually about 8ft. x 3ft. 3in. x 18in., but there are many variations, though the depth does not exceed 20in.

This type also operates very satisfactorily and the initial cost is reasonable if the grower does most of the construction. The tractor lift is also available for outloading palleted cases on to a motor truck. Oversize tyres, kept at a higher pressure than normal, are advisable on the tractor for carting in from the orchard.

If desired, two or four of these bins (placed end to end with a second layer on top) can be carried in from the orchard on a flat 16ft. trailer. This allows the tractor lift to load or unload each bin without interference from the central trailer wheels. The provision of such trailers could be a second-year improvement, if they are warranted.

Most sheds require little if any alteration with this system, but an L-shaped extension may prove a cheap and convenient addition to a narrow shed.

With ample bins and reasonable storage space for them stacked in the shed in tiers this system provides plenty of reserve fruit. Though the tractor is rather tied to the shed for replacement of bins, the tractor lift has many other uses in the orchard, apart from being the pivot of this system.

Type 3

What may be called a hybrid system between the two already described has now been developed and is likely to prove very popular for average-sized orchards.

This consists of the use of an elevator and mercury-switch-controlled hopper at the end of the grader (as for Type 1), but with the end of the elevator resting on the shed floor. No well is required. At right angles to the elevator is a special type of steel conveyer which is 4ft. wide and mounted on steel supports about 3ft. from floor level. Each bin rests on a separate steel trolley or frame which runs on steel wheels along the angle-iron top rail of the conveyer. A section of the conveyer just opposite the elevator has a knee-action tilting device.

The bins 8ft. x 3ft. 3in. x 20in.) of fruit are carried from the orchard on a tractor lift and placed crosswise on the conveyer. A number of bins, depending on the length of the conveyer, can be held in reserve on it and the bins moved along as required and tilted toward a very small hopper near the foot of the elevator.

Once the end boards are removed and the elevator equipment is put in motion the fruit slides out of the bin and is picked up by the elevator steps and moved on to the hopper and grader as described for Type 1. When empty, bins are returned to the flat position and either removed or pushed along to an extension of the conveyer and later returned to the pickers by the tractor lift.

Shed doors giving tractor access to each end of the conveyer allow the bins to be put on one end, moved along and emptied, and taken away through the other end.

Here again the tractor lift is available to outload the palleted fruit after packing. This type can be classed as a complete unit to handle the fruit from the tree to final outloading. There is a controlled and steady flow of fruit to the grader and an ample reserve of fruit on the conveyer or stacked in the shed. Because of this the tractor is not tied to the shed for bin replacement. Altogether Type 3 is a simple system with many advantages, including fairly reasonable cost of installation.

Precautions and General Comments

Officers of the Horticulture Division, though always interested in encourag-

ing promising new developments, have been very conscious of the need for safeguarding careful handling of fruit so that it may reach the consumer in the best possible condition. A close watch has therefore been kept on fruit harvested by bulk handling methods since their introduction. The system has been found to be quite successful, provided some reasonable precautions are taken. Some of these precautions, and some general comments, are as follows:—

1 Where large trailer bins are used they should preferably be fitted with wide-tread, aeroplane-type tyres.

2 The timber for the bins should be selected, knot-free material and thoroughly planed or sanded. At least three coats of paint are necessary, with the final one giving a glossy finish. If the timber is at all rough, linoleum, hardboard, or plastic liners may be necessary.

3 To safeguard the condition of the fruit in the bins until it can be packed the bins should be stacked in a cool shed, with sufficient air movement between the tiers, or stood under trees. Waterproof covers should be provided if the bins are standing outside and rain is likely. It is also suggested that an inch gap should be provided between the floor boards and the side boards to assist aeration and cooling of the fruit. If this gap is left, the inside bottom edges of side boards should be bevelled smooth.

4 To avoid undue pressure on the fruit the bins should not be more than 20in. deep. When bins are tilted for discharge toward the grader bench or conveyer belt the angle should be sufficient (about 35 degrees) to make the fruit slide rather than roll.

5 Trapdoor openings and other possible damage spots should be cushioned with sheet or sponge rubber or perhaps felt. It is also necessary to guard against fruit bouncing from the top of the elevator to the control hopper. A drag sheet of canvas or rubber or a hanging curtain of sponge rubber just in front of the elevator top will prevent this. Occasionally a fruit will drop from one of the steps high up on the elevator to the fruit below. Damage to fruit from this cause can be avoided by fixing a 4in. strip of sponge rubber across the lower part of the elevator to check the fall of the fruit when it tumbles.

If fruit falls off the elevator, it usually indicates that it is being fed on too quickly.

6 Where fork lifts are attached to the front of tractors it is advisable to fit oversize and higher-pressure tyres. These greatly assist steering. Rear-fitted fork lifts make the steering light, but the rear tyres of the tractor cushion the ride of the fruit better.

Opinions differ as to whether rear-fitted or front-fitted lifts are better, but so far front-fitted lifts are more common. Some tractors have both front and rear lifts, enabling two bins to be carried in from the orchard on the one trip, but one of the lifts can raise the bin only high enough to carry it to the shed; there it is lowered to the ground and picked up by the other lift for final manoeuvring.

Various types of compensating weights are used, either at the front or the rear of the tractor, when single bins are carried.

7 Ordinary commercial fork-lift trucks can be used in place of tractor-attached lifts, but only in the packing shed, because of their small wheels. They cost much more than the tractor fittings.

8 To increase the speed of operations and to assure smooth carriage of fruit to the shed it is recommended that any roughness along headlands or orchard roadways should be levelled out periodically with a grader blade on the tractor. Such a blade could be shared by neighbouring growers.

9 The low trailer bins are at a more convenient level for the emptying of picking bags than are the wheelless bins, which rest on the ground near the trees being picked.

10 A stepped well for the Type 1 system may be safer for shed workers than a well with sloping sides. A few stepped wells are already operating quite successfully.

11 Self-locking pulleys for lifting trailer-bin drawbars when bins are tilted toward the conveyer belt are a distinct advantage.

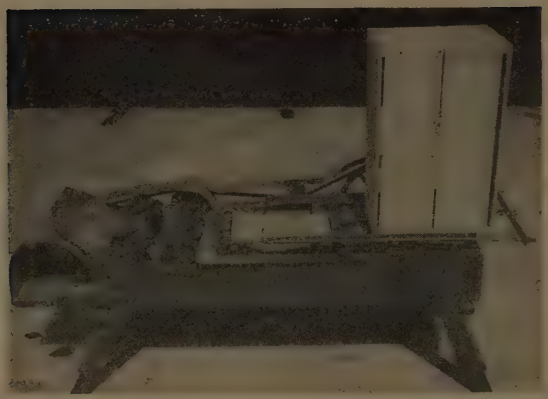
12 One grower with a Type 1 installation operates trailer bins one side of the well and wheelless bins on the other side. The latter are lowered by a fork lift on to sloping frames near the well and the tail boards are then removed. This system allows the grower a larger reserve of fruit under cover and gives him more flexibility in the handling of his very large Sturmer apple crop.

13 To allow for the calculation of individual tallies for contract pickers, trailer bins can have a permanent lengthwise dividing board and also provision for removable quarter-section cross-boards, which must be lifted out before the bins are tilted at the well.

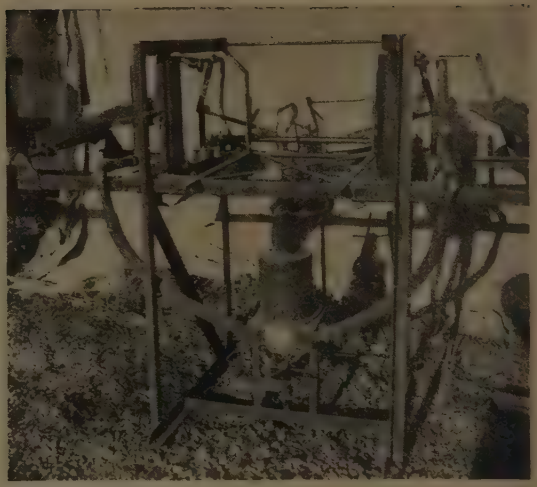
14 Both contract picking and packing teams prefer operating with bulk harvesting bin systems. Ample bins and good transport organisation are necessary to assure that pickers are adequately serviced.

15 Though some stone fruit has been handled with bulk harvesting equipment, there not only appear to be limitations in its use, but some extra

Loading a pallet of packed export fruit on to a motor truck with a fork-lift truck. Each pallet holds 35 bushel cases.



One type of electrically operated case-labelling machine. Paste is applied by roller brushes at right (under the case), the label is picked up in the middle, and the roller brushes at left secure the label. There are three quick movements from right to left.



Another type of case-labelling machine, operated hydraulically, which can label both ends at the same time.

precautions are necessary to avoid damage to the fruit. For instance, all fruit would have to be very firm and the bins not more than half filled. Until more is seen of the use of bulk handling with stone fruit, firm recommendations cannot be made.

Cost of Installation

The cost of the bulk handling equipment described depends a good deal on the amount of installation done by the grower, such as in the construction of bins or trailer bins and concrete wells. The approximate present cost when complete systems are purchased and installed by tradesmen are £1400 to £1500 for Type 1, £400 to £500 for Type 2, and £650 to £750 for Type 3.

A case-making machine fitted with an attachment for automatic lidding of packed cases.

A new machine which has been specially designed both to make up cases and to attach lids automatically to packed cases. Pressure is exerted for the purpose by an upward hydraulic thrust of the case.

The prices quoted include about £220 for a fork-lift attachment for a tractor, but will vary according to the number of bins, trailer bins, or flat trailers considered necessary. Generally, a limited number is provided in the first season and is added to as a grower's conditions appear to warrant.

Lidding and Labelling Machines

Developments are being made in machines designed to make up cases and lid cases. Some are specially designed to do both jobs, and other ordinary case-making machines can have fittings attached which will allow them to be used for lidding.

At least two types of machines have been designed to attach export and local-market labels to the ends of cases before packing. As yet they are somewhat in the experimental stage, but are proving to be of great assistance in packing sheds.

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"The New Zealand Journal of Agriculture", November 1954, p. 459, "Bulk Handling of Fruit", T. Conway.

"The New Zealand Journal of Agriculture", October 1954, p. 355, "Fork Lift Attachment for Hydraulically Equipped Tractors", N. B. Congdon.

"The New Zealand Orchardist", December 1953, "Modern Methods of Handling Fruit in New Zealand", G. S. Northcote.

Acknowledgment

The assistance received by the author from New Zealand Fruitgrowers' Federation officers at Hastings is acknowledged.

Improved Management Would Give Much Higher Pig Production

RECENT farm surveys show some of the reasons for the low national average of about 9 pigs slaughtered per breeding sow per year. They also indicate that the reasonable standards of production achieved by many farmers are within the reach of all producers. In this article E. D. Edwards, Technical Officer, Department of Agriculture, Wellington, suggests methods of improving production to attain better over-all results per sow.

MOST of the losses among pigs are due to faulty management. Even with the existing breeding stock and buildings much better returns are possible. The expenditure of hundreds of pounds on new stock and buildings at the outset to get better results is not what is being advocated here. In some cases such expenditure is the only alternative, but generally the increased returns from better management soon enable such capital requirements to be met easily enough, if spread over several years.

Arranging Farrowings to Fit Food Supply

Many of the problems at the piggery arise from inadequate care and management of the sow. Failure to breed, small litters, and weak litters are often due to bad feeding methods. Empty sows seriously interfere with a plan which will enable the dairy by-product to be used to best advantage.

Another common situation is where a plan is followed but the sows farrow too late, in say late July and again in January. This usually means that many of the autumn litters are kept over winter on short rations and then almost "drowned" in surplus milk in spring. The spring litters may also be on short rations until the pigs that have been carried over winter have been fattened.

Two cases from a recent survey illustrate the points made above: On one farm pigs from a litter born in late February were sold as heavy porkers in November; on another farm baconers had been getting 12 gallons of skimmed milk each every day, though they required no more than 6 gallons.

Disease is often associated with overfeeding of wintered pigs. Digestive upsets caused by sudden changes in diet or excessive amounts of liquids soon lower resistance to infection. The risk of introducing disease is one bad feature of the unwise policy of buying in pigs to fatten rather than breeding them on the farm. Losses in wintered pigs are sometimes as high as 80 per cent. These losses may not occur every year and are soon forgotten, but if a tally were kept of them over several seasons, the result would show clearly how serious was this wastage.

Farrowing Plan

The practice of holding pigs in store condition must be avoided if possible. A farrowing plan which is likely to give best results is as follows:—

Aim at having the first sows farrowing about 6 weeks before the cows start calving. If, for example, the farm carries 40 cows averaging 300lb. of butterfat and the herd begins calving early in July, 5 sows could be run, assuming that one would be culled after her spring litter.

Two sows should farrow in the first fortnight of May and their litters should go off as porkers. One sow should farrow in the latter part of June, her progeny being sold as baconers. The last two sows should farrow during the second week in July, one litter being sold as porkers and the other as baconers.

The aim should be to get two litters during the year from each sow and be able to sell both litters, the second as porkers, before winter. This will involve mating after weaning at 8 weeks, or even at 6 weeks if the litter is doing well and it is desired to advance a mating. Such a plan will necessitate the feeding of supplements, particularly meals, during the litter's early stages.

Where suitable facilities are available early weaning of spring litters at about 10 days of age (described in Department of Agriculture Bulletin No. 389, "Early Weaning of Pigs", available free from any office of the Department) is advocated, principally because it enables the sows to be remated for the second litter a month earlier than is possible under normal weaning. Better use is then made of the food available and no second-litter pigs should have to be carried over winter.

Feeding Supplements

Farmers often claim that they cannot afford to feed meal at its present price. Of course there must be a limit in feeding purchased meals, and this will not permit very much to be bought for pigs which are kept in cold, draughty houses, are exposed to disease, and have insufficient trough space. A considerable amount of meal can be wasted through lack of care in putting it into troughs and in filling creep troughs too full.

However, records kept by a number of farmers in recent years show that where pigs are reasonably well managed meal can be used profitably at about ½ ton per sow per year.

Sows should be fed so that they improve in condition after mating and again before farrowing.

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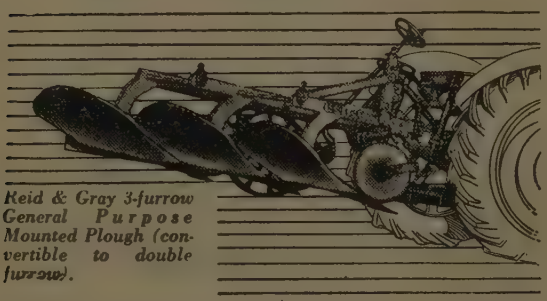

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A heat lamp, safety zone, guard rails, and suitable bedding are desirable features in a farrowing house to reduce losses among newly born pigs.

The best value is obtained for meals when they are fed to pigs in their early stages of growth. A meal having a high protein content should be fed in a creep trough (protected from the weather and the sow) to suckers from 2 to 3 weeks of age. For early weaned pigs special sow milk replacement pellets and meal are available.

Normally suckled pigs which have settled down to creep food suffer no great check when the sow is removed from them. From that stage they will also do quite well on meals of lower protein content, such as grain meals.

During the first 8 weeks the litter should have access to good leafy pasture and clean soil. With creep feeding a good strain of pigs will average 40lb. liveweight at the end of this period. The weight of a pig at 16 weeks is normally 2½ times its weight at 8 weeks, which emphasises the importance of proper treatment before weaning.

Meal feeding can be tapered off and cease when pigs reach porker weights. Some farmers continue feeding a very small amount right through to baconer weights, as they are convinced it pays. In autumn quite heavy meal feeding, say 1lb. per pig per day for a time, may be desirable to get pigs to porker weights on a rapidly dwindling milk supply. If a crop like fodder beet is available, it can be fed as an additional supplement.

The use of meal at a fairly heavy rate to bring porkers up to weight in autumn may be considered, as an example, in relation to a line of pigs averaging 45lb. carcass weight. If these are put over the hooks on the underweight schedule, they may gross only about £2 5s. each. If the pigs are held and fed meal for one month at an average of 1lb. per head daily until they have a carcass weight of 65lb., they would return £5 gross each. This will be achieved at a cost for meal of not more than 10s. per pig. Surely this method must appeal more than the alternatives of selling underweight carcasses or overwintering.

Sow Management

The following are a few of the most neglected features in sow management:—

Sows should not be mated until they are 8 months old. Even then they must weigh nearly 250lb. liveweight, though they should not be overfat at mating. The small, weedy sows which are so often seen are partly the result of allowing all breeding stock to run together and partly of trying to correct a farrowing plan that has failed by mating a gilt early to bridge the gap. This approach only perpetuates the problem.

The aim in feeding the sow should be to see that she improves in condition after mating and again before farrowing. Plenty of exercise on good pasture is desirable during pregnancy, and if necessary, milk or meal should be fed to keep her in firm condition. The condition of the sow during pregnancy influences her ability to milk well after farrowing, at which time also her condition and the size of the litter should determine the amount of food she is given. As a guide in this respect she should be fed 4 food units for her maintenance plus ¾ food unit for each pig suckled.

Sows which farrow 10 to 12 good pigs consistently are to be preferred to those farrowing larger litters. A target of 300lb. of pig meat a litter at weaning twice a year is not beyond the reach of producers.

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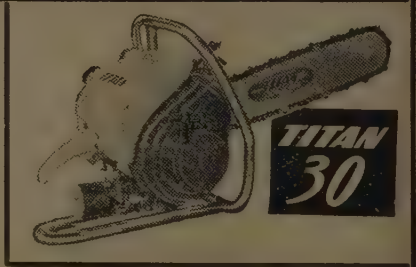

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Litters should be encouraged to take extra food in the form of meal or pellets as soon as possible. Meal feeding should continue for at least a month after weaning.

Reducing Losses

A farm survey in 1949 revealed that 27 per cent. of all pigs born were lost before weaning. Pigs that were born dead or died at birth accounted for 15 per cent. Better feeding of the sow before farrowing must be of value in reducing this latter figure, though the matter still poses a problem for research workers.

Overlying by the sow accounts for over 8 per cent. of deaths and is by far the largest cause of loss of piglets born with a chance of survival. This aspect has received much attention in recent years.

As a means of reducing such losses the round farrowing house or a house converted on the principle of the round house design has much to commend it. The infra-red heat lamp, which is essential in a round farrowing house, is also desirable in houses of more orthodox design for a few days after farrowing.

If these safeguards cannot be provided immediately, farmers would still benefit by making the farrowing house or at least a portion of it as cosy as possible. Open-fronted houses could be boarded up, leaving only access for the sow and provision for a shutter. All holes that cause draughts could be covered. Timber or hardboard or similar lining under the rafters would improve the insulation of the house. A kennel in one corner of the house might be a solution. This work need not involve much time or expense, yet it may save the lives of one or two pigs in each litter.

Losses from disease both before and after weaning may be reduced, first by good feeding and hygiene and secondly by calling in the local veterinarian for advice.

Better Use of Food

Food wastage due to inefficient food utilisation is also a factor in the low return per sow in New Zealand. Poor housing conditions, bad feeding methods, and infections are all responsible, though actual deaths may be few and infrequent.

Because in New Zealand skimmed milk or whey is virtually costless, farmers are not greatly concerned about using them efficiently. In the United Kingdom and some other European countries the food-conversion efficiency figure of litters is watched very carefully, as on it may depend whether a profit or loss is shown.

It is now generally accepted that pigs will fatten most economically in well-insulated housing where there is no great variation in temperature. A temperature of 65 degrees F. is suggested as a suitable level and, incidentally, this is the most comfortable temperature for men to work under.

During the past 2 years more than 20 farmers have kept records of meals and crops used during the season. The quantity of skimmed milk or whey fed has been calculated and an estimate made of how efficiently all the food used by both breeding and fattening stock is converted into pig meat.

PIG MANAGEMENT . . .

A considerable difference between farms is apparent; farms showing the most economical use of food had well-insulated houses and control over ventilation, though it is possible that these farmers are better managers and have better stock. However, the results indicate how valuable good housing is. Many existing fattening houses could be improved considerably at little expense in the ways suggested earlier for farrowing houses.

What Improvement Can be Expected?

The first reaction perhaps from farmers to what has been suggested in this article is that it means more work for them and consequently is of no interest to them.

Farmers who do well with pigs expect to spend nearly an hour each day at the piggery with an 8-sow herd. It would be safe to say that many others with similar-sized units require much more time and reap about half the reward.

The improvement obtained by one farmer who kept records of production for 2 years is illuminating. By more careful feeding and cleaning methods in the second year he doubled his net return. A little less meal was purchased and it was used less wastefully than in the previous year.

In the first year 45 per cent. of the pigs were sold as stores and 55 per cent. as porkers. In the second year 92 per cent. were sold as porkers and 8 per cent. as baconers, an increase in total pig meat produced of more than 30001b. This was achieved on a 10-sow farm with 75 cows at a cost of 10 minutes' extra work each day. Only 10.7 pigs per sow were sold during that second year, but this farmer can and will do better.

The average sales for the year for 15 skimmed milk farms were 12.7 pigs per sow, giving a net return of 8.6d. per pound of butterfat. Two of these farmers sold nearly 17 fat pigs per sow. Two whey piggeries averaged 10.6 pigs per sow and 3.7d. per pound butterfat.

These figures indicate the scope for improvement on the vast majority of farms, because the national average is only 9 pigs for slaughter per sow. It is hoped that by making the farmer aware of the potential value of his pigs more interest will be shown in this sideline. Only then will an effort be made to develop pig keeping into a really profitable business by planning a layout which will enable the essential tasks to be performed easily and quickly and by organising the work to make efficient use of the stock and foodstuffs available.

Radio Broadcasts for Farmers

RADIO broadcasts for farmers during July are as follows:—

1YA Auckland, 7.45 p.m.

3 July—Talk by officer of Animal Industry Division, Department of Agriculture, Auckland.

10 July—Talk by officer of Department of Agriculture Rukuhia Soil Research Station, Hamilton.

17 July—Talk by officer of Animal Industry Division.

24 July—"Trace Elements in Topdressing", by G. B. Haddow, Instructor in Agriculture, Department of Agriculture, Auckland.

31 July—Talk by officer of Animal Industry Division, Department of Agriculture, Auckland.

1XH Hamilton, 12.33 p.m.

8 July—"Preparation for Lambing", by L. P. Wells, Livestock Instructor, Department of Agriculture, Hamilton.

15 July—"Supplementary Crops", by J. R. Murray, Instructor in Agriculture, Department of Agriculture, Hamilton.

22 July—"The Farm and its Finance", by M. G. Hewitt, Federated Farmers, Hamilton.

29 July—"Meeting the Pasture's Need for Water", by H. G. Hopewell, Department of Agriculture, Rukuhia Soil Research Station, Hamilton.

1YZ Rotorua, 7.15 p.m.

10 July—"Development of Fern Country in the Bay of Plenty", by A. V. Allo, Instructor in Agriculture, Department of Agriculture, Tauranga.

24 July—"Remedies for Quality Faults at Milking Sheds", by E. P. Carter, Special Inspector, Department of Agriculture, Hamilton.

2XA Wanganui, 8. p.m.

4 July—"For the Country Woman", by Mary MacDonald.

11 July—"The Radio Vet.", by S. Jamieson, Veterinarian, Department of Agriculture, Wanganui.

18 July—Talk by C. M. Bailey, Supervisor, Taranaki District Pig Council.

25 July—"The Marton Experimental Farm", by A. A. Duncan, Instructor in Agriculture, Department of Agriculture, Wanganui.

2XG Gisborne, 8 p.m.

30 July—"Stockowners' Question Time", by E. B. Smythe, Livestock Instructor, Department of Agriculture, Gisborne.

2YZ Napier, 7.10 p.m.

2 July—Care of Cream and Milk on the Farm", by L. W. Scott, Farm Dairy Instructor, Department of Agriculture, Hastings.

16 July—"Farm Management in Hawke's Bay", by G. M. Bennett, Fields Instructor, Department of Agriculture, Hastings.

30 July—"Feeding and Management of Day-old Chicks", by H. K. Mullins, Poultry Instructor, Department of Agriculture, Hastings.

2ZA Palmerston North, 12.33 p.m.

1 July—"Lambing Troubles", by C. R. M. Jones, Livestock Instructor, Department of Agriculture, Dannevirke.

8 July—"Barley Grass Control", by J. A. Graham, Fields Instructor, Department of Agriculture, Palmerston North.

15 July—"Water on the Market Garden", by G. N. Paulin, Horticultural Instructor, Department of Agriculture, Palmerston North.

22 July—"The Use of Machinery in Drainage", by K. L. Mayo, Instructor in Agriculture (Farm Drainage), Department of Agriculture, Palmerston North.

29 July—"Housewife Discusses her Poultry Disease Problems with the Poultry Instructor", by M. E. White, Poultry Instructor, Department of Agriculture, Levin.

3YA Christchurch, 12.20 p.m.

1 July—"Food for Iron", by Eleanor Couston, Field Officer in Rural Sociology, Department of Agriculture, Christchurch.

15 July—Review of "The New Zealand Journal of Agriculture", by E. G. Smith, Instructor in Agriculture, Department of Agriculture, Rangiora.

4YA Dunedin and 4YZ Invercargill, 12.33 p.m.

1 July—"Weed Control in Lucerne", by T. G. Sewell, Instructor in Agriculture, Department of Agriculture, Gore.

8 July—"Problems of Land Development", by A. G. Elliott, Superintendent, Extension Division, Department of Agriculture, Dunedin.

15 July—"Disease Prevention in Stock", by C. E. Isaacs, Veterinarian, Department of Agriculture, Invercargill.

22 July—"Spring-sown Cereals", by J. G. Richards, Instructor in Agriculture, Department of Agriculture, Oamaru.

29 July—"Prevention of Erosion", by G. G. Calder, District Soil Conservator, Department of Agriculture, Dunedin.

4YZ Invercargill (following joint programme from 4YA and 4YZ)

1 July—"Pollination as it Affects the Farmer", by D. Seal, Apiary Instructor, Department of Agriculture, Invercargill.

8 July—"DDT", by L. T. Reid, Fields Instructor, Department of Agriculture, Gore.

15 July—"Milk Fever in Ewes", by K. G. Gray, Livestock Instructor, Department of Agriculture, Invercargill.

22 July—"Potash", by A. R. Rankin, Fields Instructor, Department of Agriculture, Invercargill.

29 July—"Pollination as it Affects the Orchardist and Gardener", by D. Seal, Apiary Instructor, Department of Agriculture, Invercargill.

Regular Sessions

1XH Hamilton, Mondays at 12.33 p.m. and Tuesdays at 8 p.m. (Frankton stock market report), Wednesdays at 12.33 p.m. (report from Ruakura Animal Research Station), Thursdays at 12.33 p.m., Fridays at 8 p.m. (stock sale review).

1XN Whangarei, Mondays at 8 p.m. (Northland livestock report and "Farming for Profit"), Wednesdays at 8 p.m. ("Farming for Profit"), and Fridays at 8 p.m. ("News for the Farmer").

1YA Auckland, Mondays at 12.33 p.m., Tuesdays, Wednesdays, and Thursdays at 7.45 p.m., and Fridays at 6 p.m. and 7.45 p.m.

1YZ Rotorua, Mondays at 12.33 p.m. (Waikato stock market review), Tuesdays at 7 p.m. (Hamilton stock market report), Wednesdays at 7.15 p.m. (Pig Council talk on fourth Wednesday of every other month), Thursdays at 12.33 p.m. and 7.15 p.m. (fortnightly).

2XA Wanganui, Wednesdays at 8 p.m. (Wanganui stock sale report), Thursdays at 8 p.m.

2XG Gisborne, Tuesdays at 8 p.m., Fridays at 8.2 p.m. (Gisborne stock market report).

2XN Nelson, Thursdays at 8 p.m.

2XP New Plymouth, Thursdays at 8.1 p.m.

2YA Wellington, Mondays at 7.15 p.m., Thursdays at 12.33 p.m., Fridays at 7 p.m. (Feilding stock market report).

2YZ Napier, Tuesdays at 12.12 p.m. (Hawke's Bay orchardist session), Tuesdays at 7.10 p.m., Wednesdays at 7.15 p.m. (Hawke's Bay-Poverty Bay livestock market report), Thursdays at 12.33 p.m.

2ZA Palmerston North, Mondays at 12.33 p.m., Fridays at 8.45 p.m. (Feilding stock market report).

3XC Timaru, Mondays at 8 p.m. (Pleasant Point stock market report), Tuesdays (fortnightly) at 8 p.m. (Temuka stock market report), Wednesdays at 8 p.m., and Saturdays at 10.30 a.m.

3YA Christchurch, Mondays at 12.20 p.m., Wednesdays at 7.15 p.m. (Addington stock market report), Thursdays at 12.33 p.m. and 7.15 p.m.

3YZ Greymouth, Mondays and Thursdays at 12.33 p.m.

4YA Dunedin, Tuesdays at 12.33 p.m., Wednesdays at 7 p.m. (Burnside stock market report), Thursdays at 12.33 p.m.

4YZ Invercargill, Mondays at 12.33 p.m., Tuesdays at 7 p.m.

▲ Lombardy poplars and pines sheltering a homestead and orchard in Cromwell Gorge. The higher country is without shelter of any kind.

Trees on the Farm

Trees Suitable for Central Otago

TO meet frequent requests for names of trees suitable for certain localities, lists are being compiled by district officers of the New Zealand Forest Service. This list for Central Otago by W. H. Jolliffe, Extension Forestry Officer, New Zealand Forest Service, is the third in this series, the others, for Northland and Westland respectively, having appeared in the February and April issues of the "Journal".

TREE planting in Central Otago is complicated by the generally low rainfall and by the frequency of frosts, often of considerable intensity. These two conditions markedly reduce the number of species which have a chance of survival without some assistance. Heavy frosts not only inhibit the growth of certain plants but may affect all kinds by raising them above the position in which they were planted—a process known as "frost lift".

Aids to Growth

Frost lift can be countered by the use of a mulch, but care must be taken to choose one which will not blow away readily or yet pack down so tightly that it becomes impervious to water. Another safeguard is to surround the young trees with tins from which the tops and bottoms have been knocked out.

Where watering in some form is feasible the range of possible trees is greatly extended and can include such desirable species as Douglas fir, larch (on hilly country), *Sequoia gigantea* (Wellingtonia), oaks, and ash.

Another aid to growing a greater variety of trees is the raising of shade-tolerant species under an open-grown nurse crop. The nurse crop could be *Eucalyptus gunni* or *Robinia* or even

A mixture of *Pinus ponderosa* (the taller trees) and *P. laricio* growing on an alluvial fan. The stand is 50 years old.

perhaps tree lucerne (*Cytisus proliferus*) and it should be allowed to grow several feet in height before the permanent crop is introduced. Trees that could be grown with such initial protection include the silver firs, hemlocks, and even western red cedar.

Where either a nurse crop or watering is not possible any means of increasing or conserving the scanty supply of rain-water should be adopted. For instance, trees should be planted in shallow hollows which will act as catchments for any rain. The mulch and the bottomless tins mentioned previously as effective against frost lift can also help in conserving moisture, though the tins can cause scorching during a hot summer.

Time of Planting

In any locality planting should be done at the beginning of the rainy season whether that occurs in late autumn, in winter, or in early spring. Plants put in then will have a better chance of becoming established before drier conditions set in.

Dry conditions necessitate wider planting than is carried out in wetter climates, because roots have to spread farther in search of moisture. It is unwise to plant closer than 8ft. x 8ft. (680 trees per acre), and 10ft. or 11ft. spacings will probably produce better results.

Generally the establishment phase gives the most trouble in Central Otago and it is worth while giving a little extra care at that stage to achieve much-needed shelter. Deaths at later stages are probably no more frequent than they are in other districts.

Recommended Species

For places without regular water supply the following tree species are recommended:—

Betula alba (European birch) is suitable for firewood and for beautification; it has a nurse value too. Sometimes it is a little difficult to establish.

Cupressus arizonica (Arizona cypress) is an ideal shelter tree, but its timber value in New Zealand is unknown at present.

Eucalyptus gunni (cider gum) gives fair shelter, at least when young, and older trees will make fair posts.

Pinus laricio (Corsican pine) is slow growing, but yields a high-density timber which, however, is not durable untreated.

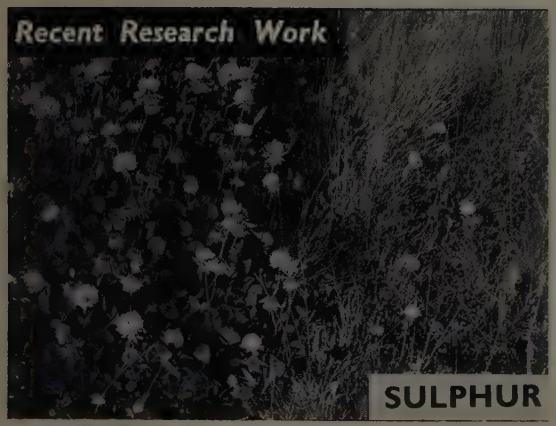
Pinus murrayana (lodgepole pine) is faster growing than Corsican pine. The timber is not durable untreated.

Pinus ponderosa is faster growing than lodgepole pine. The timber is similar to radiata pine.

Populus nigra var. *italica* (Lombardy poplar) is fast growing, and the trees give good shelter if they are planted close enough. The timber will make battens.

Robinia pseudacacia is not quite as hardy as the other trees listed here, but is worth a little more care because of the durability of its timber.

Small trees or shrubs suitable for shelter or beautification in dry, frosty areas are: *Laburnum vulgare*, which has prospects as a nurse tree; *Ligustrum* sp. (privet), which is a useful hedge plant; *Prunus cerasifera* (cherry plum), which is suitable for shelter in orchards; *Salix caprea* (pussy willow), which gives good medium shelter; and *Sorbus aucuparia* and *S. discolor* (rowans), which are used for beautification mainly.



THIRTEEN pasture topdressing trials in which sulphur has been included have been conducted in the Hororata-Rakaia Gorge area during 1955 and 1956. These trials have covered five main soil types, Kakahu, Kowhai, Ruapuna, Mayfield, and Lismore. The trials were laid down mainly on native tussock which had received little or no treatment with superphosphate and lime.

LOCATION OF TRIALS

THE trial areas are situated 50 to 60 miles from the coast. Altitudes range from 800ft. to 1600ft. with the Lismore and Mayfield types at the lower altitude, Ruapuna intermediate, and Kowhai and Kakahu at the higher altitude. Rainfall varies from about 28in. per annum on the Lismore soil type to about 32in. on the Mayfield, rising to 40in. on the Kakahu soil type.

KAKAHU SOILS

Excellent responses have been received from the applications of sulphur and molybdenum on the Kakahu soil. Phosphate alone (in the form of double superphosphate) gave no response even though the phosphate soil test was low, but when it was applied with sulphur the response was better than to sulphur alone. Indications are that this series will respond well to lime. Elemental sulphur gave a fairly quick response in trials on this soil type, whereas on some other soils the response has been very slow, in some cases up to 2 years before reaching a maximum.

KOWHAI SOILS

Soils of the Kowhai series are of more recent origin than the Kakahu series and consist mainly of terrace country adjacent to and overlooking the Rakaia River. The rainfall is slightly lower than on the Kakahu series. They are less acid than the Kakahu soils and usually have a high phosphate soil test. Trials on these Kowhai soils indicate that they are particularly sulphur responsive, but only slightly responsive to lime. Good molybdenum responses have also been obtained on most of the trials. The three trials on this soil type which have been down longest all show that excellent clover establishment can be obtained by oversowing and topdressing with superphosphate plus molybdenum. On two of the trials gypsum gave excellent results, especially when applied with molybdenum, whereas elemental sulphur was slow acting by comparison.

RUAPUNA SOILS

Of the four trials on the Ruapuna soils, three have produced excellent responses to sulphur (two to elemental sulphur and one to superphosphate), while the other has not been down long enough to produce results. One of these trials on lucerne and cocksfoot did not indicate a response to elemental sulphur until after the first year.

MAYFIELD SOILS

On trials laid down on the Mayfield soils excellent responses were obtained from superphosphate plus molybdenum, superphosphate plus lime, and superphosphate alone, the response to superphosphate plus molybdenum being equal to that of superphosphate plus lime. Gypsum plus molybdenum has responded well, but elemental sulphur has been much slower acting. An interesting feature on one trial is that when applied with both lime and superphosphate, molybdenum appears to have a depressing effect. A slight depressing effect also occurred where molybdenum was applied without sulphur and phosphate.

LISMORE SOILS

The trials on the Lismore series seem to show that best results will be obtained from the application of lime plus sulphur plus phosphorus; in other words superphosphate plus lime. Molybdenum should be used with caution and not without advice from the Department of Agriculture.

OVERSOWING CLOVERS

All the trials on the tussock country of the Kakahu, Kowhai, and Mayfield series were oversown with red clover, white clover, and alsike, all of which established and grew well in spite of an abnormally dry season. Best results were obtained from oversowing and topdressing in late winter, one of the best trials being laid down on snow in late July. So far no clover inoculation problems have been encountered, as clovers have established readily without being inoculated.

FURTHER TRIALS

Excellent responses have been obtained so far, but further investigation is necessary, particularly with regard to rates of application of sulphur, phosphorus, and lime.

Trials have also been extended to include the tussock covered Tekapo, Pukaki, Tekoa, and Cass soil types, which occur at the same levels as or higher than Kakahu soils.

Results of the new trials, which include minor-element trials, rate of topdressing trials, the use of hydrated lime and sulphate of ammonia, and plant-introduction trials (with the grassland sod-seeder and grassland tips on a standard drill), should be available soon and will be published in a future issue of the "Journal".

—R. L. BENNETTS

HEADING PHOTOGRAPH: The response to sulphur in a topdressing trial in the Hororata-Rakaia Gorge area 6 months after topdressing and oversowing. Left—Phosphate plus sulphur. Right—Phosphate only. The trial was sown in winter on snow.

In this trial in the Rakaia Gorge area the part on the left received no fertiliser and that on the right phosphate plus sulphur.

The Use of
Liquid Manure

By E. D. EDWARDS,
Technical Officer,
Department of Agriculture,
Wellington

Mr. Julian topdressing a paddock with liquid manure.

The pasture on the left has been treated with the untreated

After the contents of the holding tank have been stirred the 500-gallon tank on the truck can be filled in 45 seconds, the operation being controlled from the driver's seat of the truck.

Pasture response 3 weeks after liquid manure fence. The pasture on the right received at acre. The area treated with liquid manure is absence of

n Dairy Farms

Mr. C. Brown, Shannon, uses liquid manure from both cowyard and piggery. The two dark strips show the response to manure from the piggery and the strip in between reveals the much poorer response obtained with cowyard manure.

liquid manure and contrasts on the right.

been applied to the left of the electric same time 3cwt. of superphosphate per green and there is an almost complete flowers.

An excellent indication of the result that can be obtained by using a spreader board shaped like a bulldozer blade.

FOR a comparatively small outlay and with a little ingenuity the dung and urine which accumulate at milking sheds and piggeries on farms can be transformed from a liability to a valuable asset. An indication of their value as a fertiliser and of the methods of collection and distribution practised by some farmers is given in this article.

THE disposal of manure from holding yards presents a problem of varying importance on dairy farms. On some farms or where the labour available is not reliable it is solved by allowing the urine and floor washings to run into creeks or over banks and shovelling the dung into a heap over a fence until it is carted to a convenient paddock.

This method is unhygienic and in certain circumstances may be condemned by health authorities.

PRE-LAMBING VACCINATION

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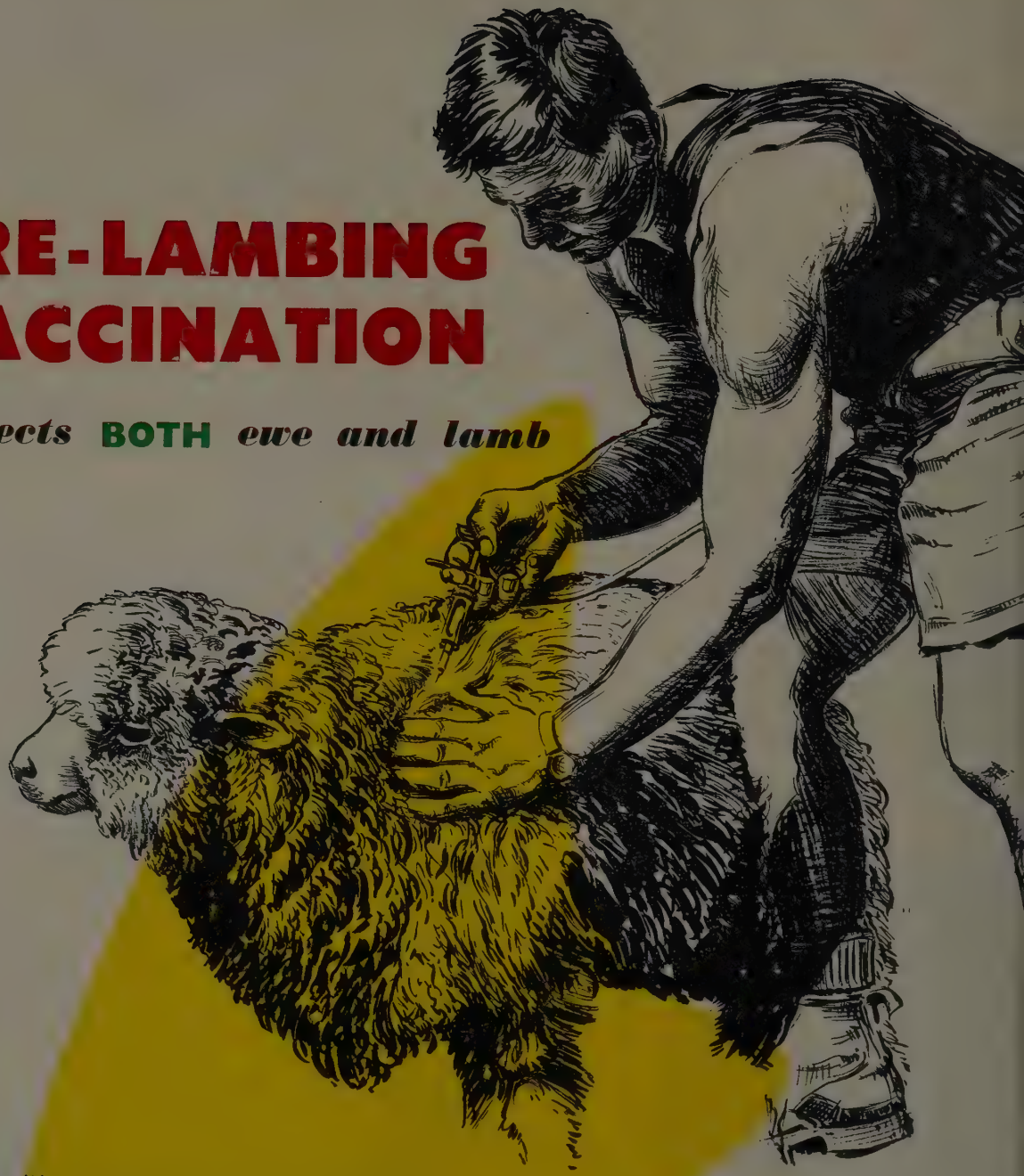

Where pulpy kidney and blackleg occur in lambs under six weeks of age, losses can be prevented by vaccinating ewes with TVL Combined Blackleg/Pulpy Kidney Vaccine about a fortnight before lambing. This procedure will also prevent blackleg in ewes at lambing time when they are particularly susceptible to this disease, especially if lambing assistance has to be given.

If ewes have not been vaccinated at tupping or in a previous year, they should be given a sensitising dose of TVL Pulpy Kidney Vaccine at least a month before the pre-lambing dose of Combined Vaccine.

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It results in most of the high manurial value of dung and urine being lost. Urine is the most valuable part and it has been wasted, and from the heap of dung much nitrogen and calcium is lost through leaching by rain.

Alternatives would be to pass the material through a septic tank or collect and distribute it as liquid manure over pastures to obtain greatest benefit from its fertiliser content.

The manure available at the milking shed represents only about 5 per cent. of the total droppings during the milking season. For a 50-cow herd about 5000 gallons a month would be collected. Unless conditions are really favourable, such as cheap facilities and large herd size, the collection and distribution of liquid manure from the cowyard alone may not be economic.

Analysis of sump contents on two farms in Taranaki shows that over a dairying season the manurial equivalents in the collection from a 50-cow herd would be as follows:—

Sulphate of ammonia ..	½ ton
30 per cent. potash salts ..	½ ton
Superphosphate	4cwt.
Carbonate of lime	4cwt.

Manure from Piggeries

Manure from the piggery offers much greater possibilities if the fattening pigs, in particular, are confined to houses. A glance at many piggeries is sufficient to reveal by the strong growth of ryegrass and the almost complete absence of clover the high fertility present in surrounding run-outs. This state of the pasture is due to a combination of mismanagement and high fertility, for the pig is a non-selective grazer. If pasture is to be of any value as a pig food, it must be young and leafy and contain a fair proportion of clover.

A stocking rate of 640 sows per acre has been achieved in spring at Ruakura without harming the pasture and it is claimed that there is no reason why pig paddocks should not have the best pasture on the farm. The important point in ensuring this is controlled grazing of pigs.

In the taking of pigs from weaning to slaughter best results are usually obtained where they are confined to houses over this period. Some 60 per cent. of total droppings would therefore be available as liquid manure. The manurial value of this material merits recognition, because it represents a considerable drain on farm fertility if it is wasted.

If home separation farms are used as an example, pasture consumed from all parts of the farm is converted into milk by the cow, and if allowance is made for fertility loss in cream sold, approximately 85 per cent. of the mineral matter in the whole milk is transferred to the piggery as skimmed milk. Pigs extract only a small amount of this for growth and reproduction, so that for practical purposes most of the mineral ingredients are passed through in the dung and urine.

▲ The sump at the piggery of Mr. P. Shannon, near Hunterville. It is adequately protected from stock.

▼ A by-pass for storm-water to keep it away from the sump should be provided in layouts where much rain-water may be collected.

The logical move at this stage is to return the manure to those parts of the farm which will show greatest response, and so complete the fertility cycle. However, despite its value as a quick-acting fertility builder, liquid manure is unlikely to be utilised fully unless it can be distributed rapidly and cheaply.

Value of Cowyard and Piggery Manure

Some idea of the manure available on a 50-cow farm on which are run 5 sows and its equivalent value as a fertiliser is given in Table 1. This must be accepted as a guide only, for many factors, such as pasture quality, production level, and supplementary pig foods, must have an influence on the value of the liquid manure.

TABLE I—APPROXIMATE VALUE OF MANURE AVAILABLE ON 50-COW FARM WITH 5-SOW PIGGERY (INTENSIVE)

Manurial equivalent	Cowyard	Piggery	Amount	Total Value £	s.	d.
Sulphate of ammonia ..	½ ton	1¾ tons	2¼ tons	67	10	0
30 per cent. potash salts	½ ton	½ ton	1 ton	34	0	0
Superphosphate	4cwt.	14cwt.	18cwt.	11	6	0
Carbonate of lime ..	4cwt.	4cwt.	8cwt.	2	10	0
				115	6	0

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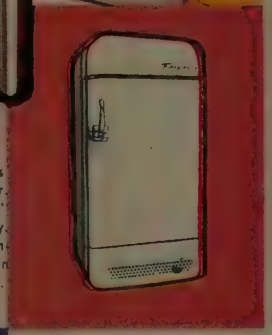

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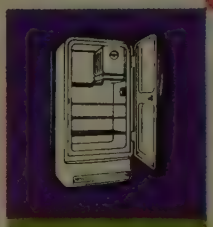

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Collection and Distribution

Wherever possible use should be made of gravity in filling distributor tanks to eliminate costly pumps. The drains from shed to sump should provide a by-pass for excessive rain-water and this is probably more important with cowyards than piggeries.

The size of the sump or storage tank required will depend on circumstances. For instance, it may suit some farmers to eliminate the sump and direct the manure straight into a distributing tank, though this will necessitate more frequent attention.

Farm observations suggest that the best response from pasture is obtained when the manure has been stored for 14 days before it is spread. To achieve this one large sump, or preferably two sumps, would be needed. However, because a thick scum tends to form on top of sumps after a few days, it is more common to see types that require emptying either daily or about twice weekly.

Some typical cases to illustrate the possibilities of efficient distribution where farmers have taken advantage of favourable sites and cheap equipment are as follows.

Gravity-filled Distributor

Mr. I. B. Julian, of Kakaramea, Taranaki, does not bother with cowyard manure. His pigs are whey fed and are fattened in a totally enclosed house of double range with ½-round glazed tile drains on either side of the central feed race. These drains meet at a gully trap outside the house, from where a single 6in. pipe carries the waste about 100ft. out to a nearby gully, where a storage tank is erected on a concrete base. The fall in the pipeline is only 1ft., but no trouble with blockage has occurred. The tank of 4000-gallon capacity is a wooden whey tank discarded from a factory. With 100 fattening pigs in the house the tank fills in 5 days.

A 500-gallon welded tank is used for spreading the manure and this is rolled on to the farm truck from a nearby bank and chocked in position. The large tap on the 4000-gallon tank enables the distributing tank to be filled in 45 seconds. Spreading of the liquid manure is controlled from the driver's seat of the truck and takes 3 to 5 minutes.

Probably the most time in this operation on any farm would be consumed in driving to and from the paddocks being treated. Since the best method of application appears to be one dressing each 2 or 3 years rather than more frequent applications, the farmer, in weighing up the time available for the job, would have to decide whether his whole farm should be treated to raise the over-all fertility, or perhaps several nearby paddocks only.

▲ This 450-gallon distributing tank is used daily by Mr. N. H. Rhodes, Huntervile, to empty a 1250-gallon sump.

▼ Pumping liquid manure into this distributor tank of 250 gallons takes 6 minutes.

Mr. Julian acquired the equipment at low cost and liquid manure from his piggery is to play an important part in his farm improvement programme. The farm has recently been subdivided to take advantage of water for irrigation from a small lake, and electric fences permit maximum utilisation of pasture over the whole farm.

Pasture growth is boosted during the drier months by the use of irrigation plus liquid manure over a restricted area and by liquid manure on remaining paddocks as is convenient.

Though liquid manure has been used for only one season, the response from both irrigated and non-irrigated pasture has been much greater and more rapid than could be obtained with artificial manure. To satisfy himself on this point Mr. Julian has conducted trials to compare liquid manure at approximately 4000 gallons to the acre with superphosphate at 3cwt. per acre.

Use of Vacuum Pumps

An example of an outfit requiring a pump to lift the liquid manure into a distributor is that on the farm of Mr. C. H. Brown, at Shannon. On this cream supply farm are run 73 cows and 11 sows. All pigs intended for the market are confined to houses, and the fattening house, with a capacity of about 50 porkers, is provided with a 400-gallon sump. At the cowyard is a 750-gallon sump, which collects any rain-water as well as floor washings.

The distributor, purchased for £90, is of ¼in. welded steel and has a capacity of 250 gallons. It is on a

chassis having aeroplane wheels and their wide tread prevents the cutting up of pastures. Attached to the distributor is an old milking machine vacuum pump which is driven off the tractor used in hauling the unit. By the insertion of the intake hose into the sump and operation of the pump the tank is filled in about 6 minutes. A comparison can be made of this rate of filling and that of the gravity fed system used on Mr. Julian's farm.

The sumps are emptied twice a week normally, but at busy periods it may be possible to do them only once weekly, and each time the job would occupy one man for most of the morning. The spring-loaded release valve is controlled from the tractor seat and directs the liquid manure on to a steel spreader, shaped like a bulldozer blade, which is 7ft. 6in. long. A typical rate of application on this farm is 2500 gallons per acre.

As can be seen in the illustration on page 553 there is a far greater response from pasture treated with piggery manure than from that treated with cowyard manure. This is mainly because of the greater dilution of the cowyard manure and its lower nitrogen content.

Mr. Brown began distributing liquid manure only during the past season, but now considers that with the results he is getting it will be a permanent feature on his farm.

Mr. P. Shannon, Putorino, near Marton, has been applying liquid manure from his piggery to pastures for a number of years. He has a vacuum-operated distributor similar to Mr. Brown's except that in use it is placed on the farm trailer. The metal plating of his first distributor was only ¼in. thick and was corroded by the acids in the manure. The plating on his new distributor, built for £80, is 3/16in., and to reduce corrosion Mr. Shannon cleans out water troughs when spreading of manure is completed, thus rinsing out the tank at the same time.

With 60 fattening pigs on hand it is necessary to empty the 1500-gallon sump once weekly and with a distributor of 520-gallon capacity 2 hours is required. Apart from its value on pasture liquid manure has been found ideal for treating ploughed land where such crops as chou moellier, swedes, sugar beet, and carrots are to be grown. The resulting increase in yield has not been measured, but Mr. Shannon is convinced that it warrants his making use also of his cowyard manure.

Conclusions

From this brief review of the experiences of three established farmers it is apparent that liquid manure collected from cowyards and piggeries can be applied successfully to pasture and cropping land.

The practice is more likely to be profitable:—

1. Where advantage can be taken of gravity to fill the distributing tank and where this tank has a capacity of approximately 500 gallons.
2. Where there are big herds and/or big numbers of housed pigs.
3. Where sufficient and reliable labour is available.
4. Where pasture and crop management is good, so that full value from the liquid manure is obtained.

Farmers contemplating using liquid manure may have suitable sumps already, but it is wise to have sumps slightly larger than required, so that at busy periods on the farm the job of emptying them can then be put off to a convenient day. The approximate capacities required for 2 weeks' supply would be as follows:—

	Gallons
50 fattening pigs on skimmed milk	2400
50 fattening pigs on whey	4800
50 cows	2400

On a 50-cow farm having 5 or 6 sows the liquid manure in terms of artificial fertilisers amounts to a value of nearly £120 a year. From this an idea can be obtained as to whether the venture would succeed on any farm. The initial outlay on equipment would be about £100 and annual charges probably £25.

There is no doubt that such a use of manure improves the sanitation about milking shed and piggery and balances the fertility of the farm. Liquid manure is not necessarily a substitute for artificial fertilisers, since soils differ in their fertility, and generally a still greater response may be obtained when, for example, lime and superphosphate are used in addition to liquid manure.

A trial on the Stratford Demonstration Farm a number of years ago gave results which show the value of liquid manure.

Two areas of a deteriorated sward were treated with one application of liquid manure and two similar areas in the same field remained untreated as a control. Wire-netting frames periodically shifted to new positions were used to prevent stock eating the growth, which was mown and weighed at intervals. Within 14 days of application exactly twice the amount of grass and clover was produced on the topdressed area than on the control. At the end of a year the differences were still pronounced. The increase in yield of grass and clover in the first year was considerably more than 2 tons per acre or approximately 16 per cent. above that produced without liquid manure.

Further details on this subject may be obtained in Department of Agriculture Bulletin No. 256, "Liquid Manure".

Meteorological Records for April

Station	Height of station above M.S.L. (ft.)	Air temperatures in degrees (Fahrenheit)				Rainfall in Inches					Bright sunshine hours
		Approx. mean	Difference from normal	Absolute maximum and minimum		Total fall	No. of days of rain	Difference from normal	Maximum fall		
				Maximum	Minimum				Amount	Date	
Kerikeri	201	60.8	— 0.3	74.0	43.2	5.39	11	— 0.21	2.37	22	170
Auckland	160	63.4	+ 3.1	74.6	50.4	2.17	14	— 2.22	0.71	22	179
Tauranga	10	59.3	+ 0.8	71.4	41.5	2.76	10	— 2.26	1.45	22	193
Ruakura	131	57.4	+ 0.8	75.6	34.8	1.99	11	— 1.75	0.37	20	156
Rotorua	975	56.0	+ 0.6	70.5	38.8	2.14	9	— 2.49	0.78	16	156
Gisborne	12	59.1	+ 1.2	74.8	41.9	1.80	8	— 1.86	1.04	23	203
New Plymouth ..	160	60.5	+ 2.4	70.0	45.0	4.83	13	+ 0.05	0.80	16	165
Kariol	2125	52.4	+ 2.0	74.5	32.8	1.48	9	— 2.34	0.47	21	
Napier	5	60.6	+ 2.1	79.3	44.0	0.56	6	— 2.07	0.23	18	195
Wanganui	72	59.8	+ 2.3	79.1	39.7	1.52	15	— 1.28	0.75	21	160
Palmerston North ..	110	58.6	+ 2.0	79.6	34.2	4.06	19	+ 0.70	1.84	21	128
Waingawa	340	56.3	+ 1.8	76.0	32.8	2.04	14	— 0.86	0.80	17	144
Wellington	415	58.7	+ 2.6	72.2	43.9	3.77	19	— 0.04	1.57	17	142
Nelson airfield ..	5	57.6	+ 3.5	69.1	40.3	7.46	14	+ 4.51	1.98	15	142
Blenheim	12	58.1	+ 2.6	72.3	35.8	5.95	11	+ 3.31	2.99	15	173
Hokitika	15	55.9	+ 3.0	69.0	38.9	18.71	22	+ 9.88	4.79	14	109
Hanmer	1270	53.4	+ 1.9	74.0	30.5	4.53	15	+ 1.19	1.72	18	127
Christchurch ..	22	55.8	+ 2.3	78.2	33.4	2.24	11	+ 0.39	0.57	15	141
Ashburton	323	54.8	+ 2.2	79.2	32.0	4.18	13	+ 1.77	1.66	17	120
Timaru	56	55.4	+ 2.4	72.2	36.9	3.53	14	+ 1.87	0.88	16	117
Alexandra	520	53.0	+ 1.9	72.0	30.3	1.26	11	— 0.09	0.33	16	120
Taieri	80	52.5	+ 1.2	76.3	34.6	2.09	11	— 0.01	0.79	16	105
Invercargill airfield ..	0	51.2	+ 1.3	71.9	32.8	3.74	15	+ 0.02	0.86	2	107
Chatham Islands ..	140	56.0	+ 2.9	66.8	42.3	3.76	13	+ 1.19	0.72	3	

Points from the Purua Foot-rot Eradication Scheme

By C. R. ENSOR,
Veterinarian, Department of Agriculture, Whangarei

EVALUATION of a scheme of the magnitude of the Purua Foot-rot Scheme, described in the March issue of the "Journal", should be expected to produce sound practical recommendations for future development. In any area scheme attention first of all has to be given to the district, weather, farmer co-operation, and the presence of natural or other boundaries, and whether the district offers a reasonable chance of disease control. Then, on an individual farm basis farmers have to ensure that fencing, both ring and internal, is sheep-proof, and that there are sufficient labour, good farm and yard layout with well-lit shearing sheds in which to work, and sufficient strategically placed footbaths for a reasonable chance of success.

AFTER a suitable farming area has been chosen for foot-rot eradication, the first question to be decided is the type of medicament to be used in treating the sheep, for if a medicament requiring footbaths is to be used, these baths will have to be constructed in strategic positions.

Over the past few years veterinary surgeons have been investigating drugs, including the antibiotics, to find an effective preparation which would cure foot-rot with one application, but that perfect cure has not yet been found.

Two main methods are used for treating foot-rot in sheep, after the feet have been pared thoroughly:—

1. Using a medicament in a footbath and walking the sheep through the bath.

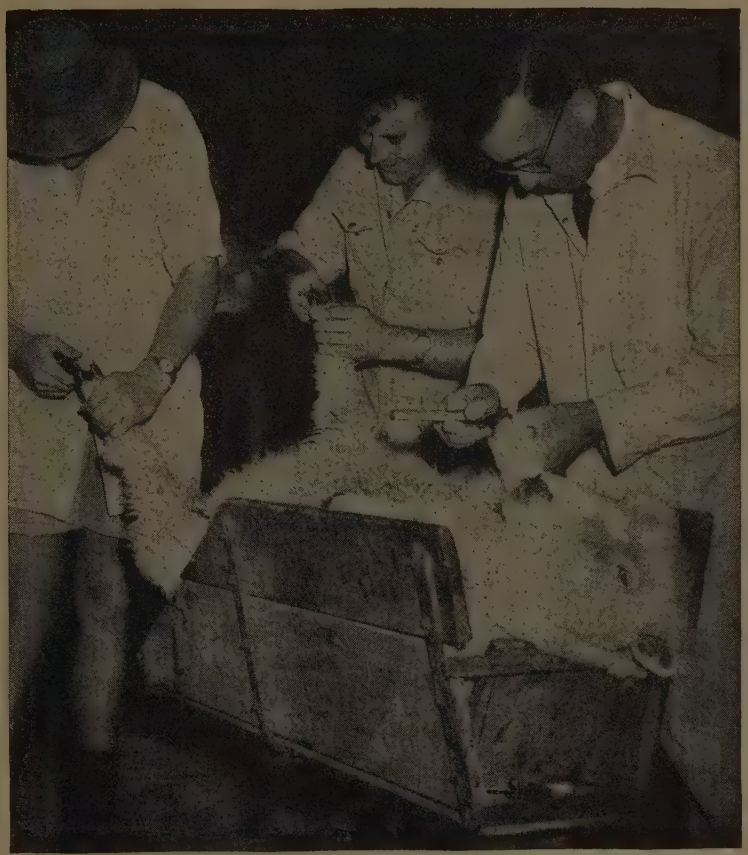
2. Treating each individual foot with a dressing which might be applied as a watery or spirituous solution or as an ointment.

Methods of administering drugs by injection have been tried unsuccessfully for foot-rot, but show quite good success with foot abscess.

Labour is the most important cost in an eradication scheme, so the time taken in applying a medicament, its cost, and its effectiveness must be considered. Because the treating of individual feet by painting on solutions or applying ointments takes longer than footbathing, it was decided to use at Purua a medicament which could be used in a footbath.

Choice of Formalin

Two drugs were considered—formalin and copper sulphate, the main medicaments used in footbaths.



["*Northern Advocate*"

The sheep cradle used in the scheme is considered the best available and is a strongly made, portable cradle which tilts to allow loading and unloading of sheep. It holds the sheep firmly on its back with the four feet presented to the operator at a convenient working height.

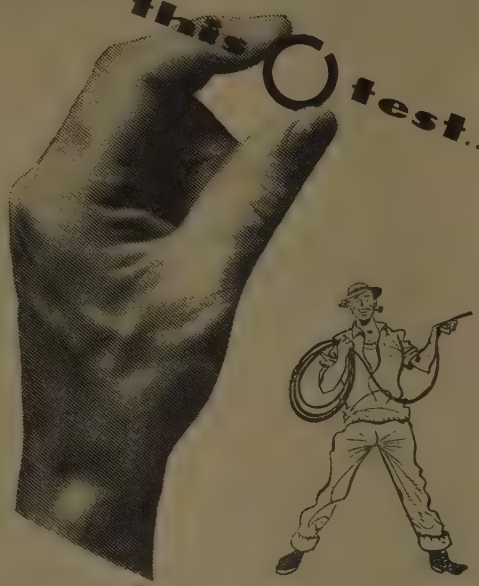
Preference was given to formalin because work in Australia has shown that it retains its anti-bacterial activity in the presence of organic material such as sheep dung for a much longer period than does copper sulphate (bluestone). Apart from that, formalin does not stain wool as bluestone does; being a solution, it is easier to mix with water than is powdered bluestone, and being a synthetic, it is not as subject as copper to supply and price fluctuations.

Formalin will deteriorate in time and form a white deposit which sinks to the bottom. Because of this deterioration it is not advisable to store formalin too long. Formalin also has another disadvantage in that it will very soon cause rusting of any iron with which it comes in contact, and if stored in iron containers for any length of time, may eventually make the container leak. It has a very pungent odour and should not be inhaled unnecessarily. It will also penetrate cuts on the hands of anyone working with it, causing a stinging sensation for a short period. However, in spite of these unpleasant properties, it is not dangerous if normal precautions are taken.

Other Medicaments

Pastes and ointments containing bactericides are marketed but are not usually recommended. Antibiotics in ointment form are available, and though these have been used overseas and have given good results, the cost of application would be too high.

make this test...



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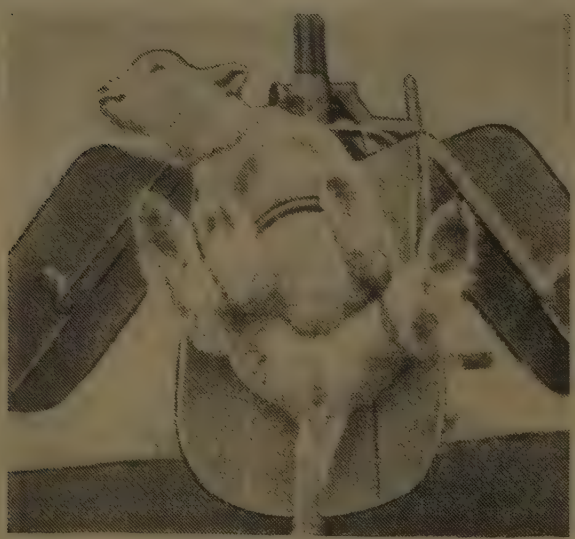

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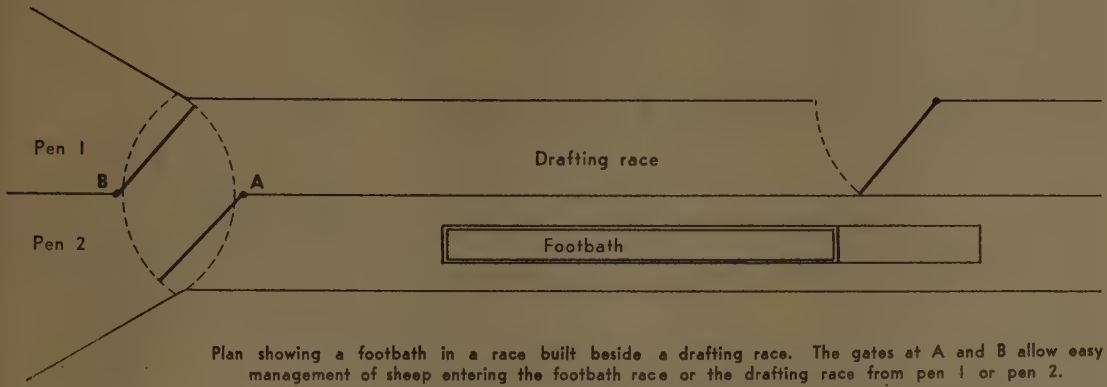


Plan showing a footbath in a race built beside a drafting race. The gates at A and B allow easy management of sheep entering the footbath race or the drafting race from pen 1 or pen 2.

Chloramphenicol (10 per cent.) in alcohol, which is available, is suitable for hand dressing sheep and can be used very effectively for individual sheep or small mobs such as rams.

The Purua scheme was not designed to compare different methods of treatment, and as the comparative efficiency of chloramphenicol and formalin had already been tried at the Department of Agriculture Animal Research Station, Wallaceville, with little advantage in favour of chloramphenicol, formalin was chosen because of its lower cost and lower cost of application.

Footbaths

Precast reinforced concrete footbaths were made in Whangarei for the Purua scheme and these were installed in suitable sites in sheepyards, usually in a race parallel to the drafting race and arranged so that the filling yards for the drafting race could be used for the foot-rot bath.

The baths were each 14ft. long, 12in. wide over-all (8in. wide in the trough), and 6in. deep. The cost per bath was £3 at the works.

Where necessary, additional footbaths were sited on farms in strategic positions to allow sheep to be driven along a road or common track which might be infected and then footbathed before going on to clean paddocks, or where they could be used for clean or convalescent sheep, away from the contaminated yards to reduce the chances of infection.

A concrete strip 3ft. long at the end of the footbath and draining back into the footbath is sufficient to catch the major part of the solution taken out of the bath by the sheep. This strip should have raised edges and a slight fall back to the bath to guide the return flow of the solution. Portable footbaths of galvanised iron are available, but because of higher initial cost and shorter life are not recommended for permanent installations.

Handling of Sheep

Because foot-rotting sheep is arduous and requires attention to detail, even on the last foot of the last sheep for the day, a number of means of holding sheep for foot-rotting were investigated before the start of the Purua scheme. If the operator is to maintain an efficient output throughout the day, he must hold the sheep firmly in a convenient position so that he can trim each foot while working in an erect position. The old method of foot-rotting struggling sheep while bending over them for hours at a time does not aid careful work.

The Cradle

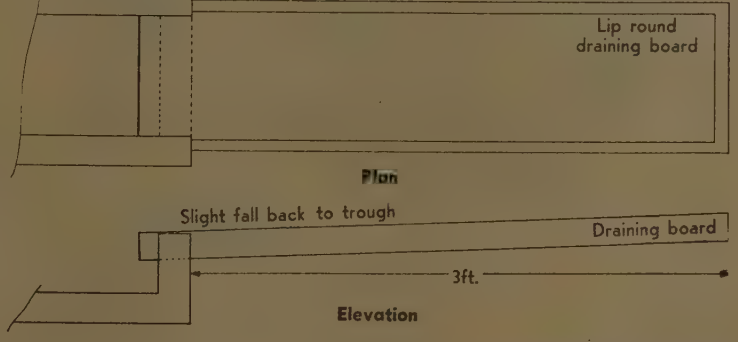
The sheep cradle was considered the best available and is a strongly made, portable cradle which tilts to allow loading and unloading of sheep. It holds the sheep firmly on its back with the four feet presented to the operator at a convenient working height. This cradle can also be rotated through a complete circle to allow the best possible use of any available light. It is also possible for two men to work at a cradle without obstructing each other.

The sheep will lie quietly in the cradle, which will take sheep of almost any size. Heavy rams are sometimes a little large to fit comfortably and newly shorn sheep do not lie quite so comfortably. For lambs an extra board can be inserted along the side of the cradle to reduce its width.

These cradles can be arranged on the shearing floor between the holding pens and the trap doors to the counting yards, one cradle to each stand. At Purua four cradles and four operators at a time were used wherever possible to keep up the output of sheep per hour and at least four operators are necessary to keep one supervisor fully occupied.

Loading the Cradles

A technique was developed by one of the farmers in the scheme to load cradles with a minimum of effort. The sheep is grasped under the brisket either by the loose skin or by the wool and lifted off its front feet, the operator then standing erect. The free hand, placed on the sheep's rump, is used to help guide the sheep as it is walked backward toward the cradle.



End of foot-rot bath, showing the draining board, which is a recommended improvement.

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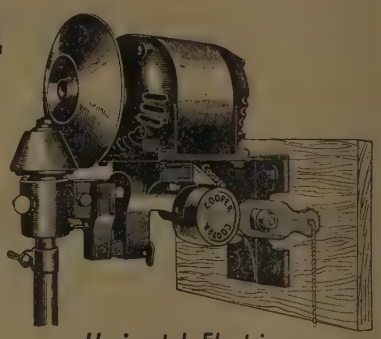

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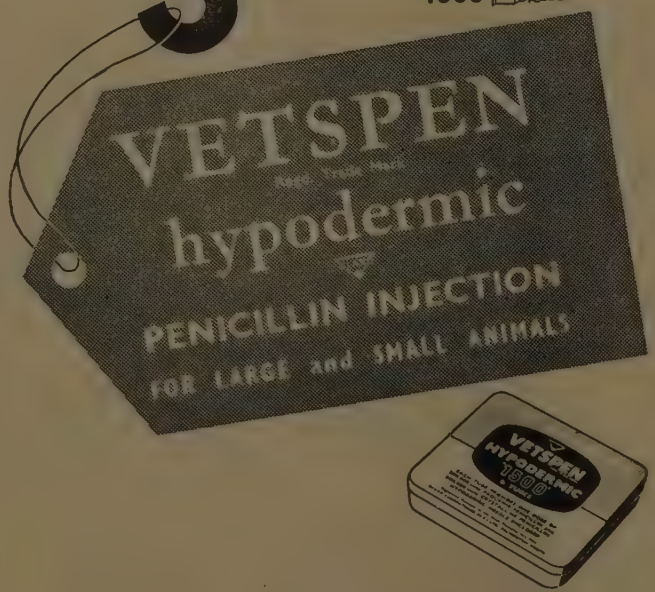

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The sheep's tail is hooked over the tail bar of the tilted cradle, and with a quick flip in one action the sheep is turned up in the cradle and the cradle returned to the horizontal position, with the sheep ready for examination and paring.

Shearing Tables

As shearing tables provide a very firm grip for the four feet of the sheep lying on the table, they could be used for foot-rotting as well as shearing.

Labour for Foot-rot Work

Much of the success of an eradication scheme depends on the careful work and attention to detail given by the foot-rotting team.

As the rate for the first examination and paring of a flock varies from five to seven sheep per man per hour, it is important to have sufficient operators so that the work does not drag out over too long a period. A working day of 8 hours is long enough for anyone to maintain efficient work.

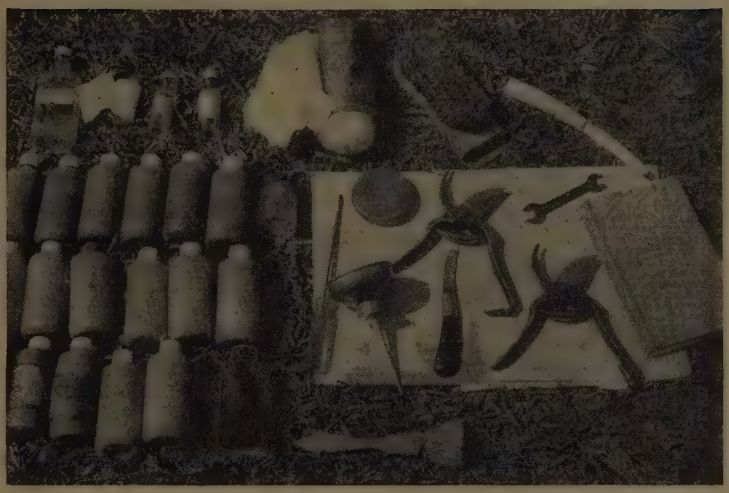
This means that a 1000-sheep flock would take, say, 150 working hours or five operators just under a week to work through. The most efficient way of organising labour would be to employ a team (as in shearing) of one supervisor and five operators, using four cradles, and arrange for the team to visit each farm in an area in succession. A good team soon becomes skilled, thus maintaining both the output of sheep per man-hour and the quality of work. There is seldom sufficient labour force on any sheep farm to supply the necessary labour for the mustering, shedding, drafting, and footbathing required in an eradication scheme as well as the actual foot-rotting work.

Instruments

To maintain speed in examining and paring feet it was necessary to choose one tool which could be used for the complete operation, because even the simple act of changing tools many times a day uses up valuable time.

The blunt-sharp type of secateur was chosen because with a small amount of practice this instrument can be used as a secateur for cutting horn or as a knife for paring away material in places where the secateur action could not be used. The fact that there is only one sharp edge to watch when cutting with the blunt-sharp type of secateur is also a decided advantage and avoids many unnecessary cuts.

The other type of secateur commonly used for foot-rotting, with two sharp pointed blades, was found to be unsatisfactory for this work because the points are more dangerous than useful, and with two sharp edges to watch unnecessary cuts are sometimes made. Also, this type of secateur is sharpened like scissors, with a bevelled cutting edge, and so could not be used as a knife. The excessive weight of the best of this type available was also a factor against its use.



[*Northland Photography*

Some of the equipment required for the prevention or treatment of foot-rot. The plastic bottles at left contain branding fluids of different colours for distinguishing sheep in different stages of treatment. The black bottle contains formalin. The secateurs are the blunt-sharp type described in the article. The book is for keeping records.

The blunt-sharp type of secateur had to be chosen carefully and very few of the makes offering fulfilled the requirements. A Swedish brand was chosen, as this secateur is made of good steel which maintains its edge well and is light yet strong and nicely balanced. There is also a fine adjustment for tightening and locking the nut which sets the blades.

A round axe stone is used to keep these blades sharp, after they have first been ground down to remove the shoulder and thus permit finer sharpening.

Though the major part of the work in the foot-rot scheme was done with these secateurs, pocket knives were also provided, though seldom used, and later, for checking feet, farriers' knives were introduced. The blade on the usual farrier's knife (or hoof searcher) was too long, so the length of the blades was reduced to 2in., which gives a far better working control. Double-edged farriers' knives are available, and wedge-shaped slip stones are used to sharpen these knives.

Trimming the Hoof

When the foot of a sheep is being examined the aim is to return the foot to its normal shape and usefulness, to remove any loose horn or debris which might harbour infection, and to leave the foot as smooth as possible so that there are no crevices or cracks where mud can lodge and so harbour infective organisms.

Bleeding must be kept to a minimum, but where it is necessary to cause bleeding to ensure that all doubtful or infected tissue is removed, the bleeding becomes of secondary importance. Control of bleeding during paring, so that the blood does not obstruct the operator's vision, is maintained by the use of one hand as a tourniquet. The foot to be trimmed is grasped firmly right round, just above the coronet, with the thumb and first finger. (Remember that the animal is on its back and that "above the coronet" is toward the heart.) It takes little practice to find the pressure points for the blood vessels supplying the foot.

All doubtful or infected horn must be removed until the operator has pared back to normal, healthy tissue. Few operators are prepared to pare far enough to start with, but it does not take an operator long once instruction has been given to realise how careful he must be with his work.

On the initial inspection all cracks, particularly on the inside walls of the digits, must be examined and, if necessary, pared out down to normal tissue. Quite often a foot-rot lesion will be found beneath the most innocent-looking crack.

The organisms causing foot-rot need protection such as an overgrown hoof or loose horn to become established, unless they enter the foot from injuries around the coronet and work down between soft tissues and the horn.

There is a structurally weak spot on the inside wall of each digit where the soft horn of the bulb changes to the harder horn of the inside wall which runs up to the toe. Possibly the stresses between the rigid and the softer horn cause cracking, which then allows the entry of organisms into the foot. This spot is always the most

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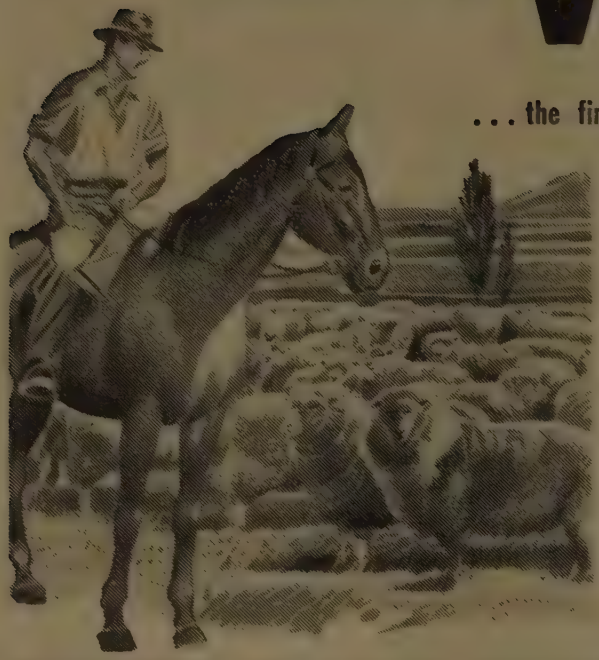

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Vacmark scours out completely. Vacmark washes out easily in wool scouring works. There is no staining or damage to the wool.

Vacmark is easily applied. Vacmark can be used with a conventional branding iron or automatic branding pad.

Vacmark has four bright colours. Vacmark is sold in four colours — black, red, blue and green. The colour of Vacmark in the tin is not a true indication of the final colour of the brand. A few days after application, the brand brightens considerably.

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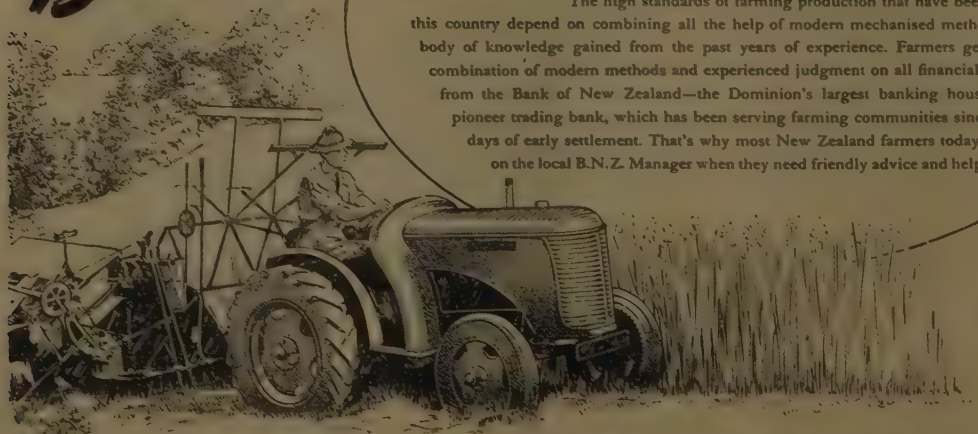

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10.6C *THE DOMINION'S LARGEST BANKING HOUSE . . OVER 360 BRANCHES AND AGENCIES IN NEW ZEALAND*

difficult area to pare and examine thoroughly.

When sheep are being examined for the first time all abnormalities should be classed as foot-rot, whether scald, foot abscess, or any other infection or injuries or warty growths between the toes. As foot-rot infection may be present in any one of these conditions, no risks can be taken, and sheep with such symptoms must be kept in the infected mob until they are cured and can be drafted to the convalescent mob. Even scabby mouth lesions round the coronet on lambs must be treated as "infected".

Granulation Tissue

Granulation tissue is an excessive growth of new tissue caused by some irritation, such as an infection or movement between two parts of the skin or horn. Wart-like growths of granulation tissue occur in the cleft between the two toes, on the inside wall of a digit where the wall often cracks, or sometimes at the tip of the toe.

When the hoof becomes too long it often breaks incompletely and for a while the animal limps around because this half-broken tip of horn is opening a crack down to the soft tissues underlying the horn. Quite frequently, because of this constant irritation granulation tissue develops, ending up as a "rosebud" at the tip of the toe. This condition has been met as a lameness in clean flocks, but the animal usually recovers spontaneously as soon as the tip of horn has broken off completely.

When these rosebuds are found in a flock with foot-rot present they are very often infected and drastic steps have to be taken to ensure recovery. In free flocks occasionally pus-forming organisms will invade these rosebuds. The infected foot should be grasped firmly so that the grip can act as a tourniquet and then the tip of the toe is cut back progressively until all affected tissue is removed. Ideally, this toe should be protected for a few days with a boot, but in a flock such individual treatment would not be practical and the animal nearly always recovers without such precautions.

After a thorough paring and checking of every foot the cradle is tipped and the sheep marked according to whether it is clean, convalescent, or infected as it falls out of the cradle. The sheep are then held in the counting yard until there are sufficient for drafting, footbathing, and removal to their respective paddocks.

Marking Sheep

Scourable branding fluids which are available on the market in plastic containers are very useful for identification. The colours available are red, blue, green, and black. Marks should be placed in positions which can be seen when the sheep approaches the person drafting. Different colours can be used or the position of the marks can be varied to differentiate between mobs. Colours other than the one used for routine wool branding should be used to avoid confusion.

All sheep which have been handled should be marked in some way so that later when the sheep are checked any unmarked one is immediately noticed, and thus some check is kept on unmustered sheep or strays. Care must be taken not to use any more branding fluid than is necessary, as wool buyers do not like brands, even if they are scourable.

Drafting

As the counting-out pens contain any type of sheep, these should be drafted as opportunity arises, and certain holding pens should be set aside for each of the clean, convalescent, and infected mobs, to keep them separate as much as possible. Once these mobs have been through the footbaths they **must** be kept separate and in later treatments follow in the same routine, clean, convalescent, and then infected, through footbaths and races. Holding all classes of sheep together in the counting-out pens is not desirable, but often cannot be avoided, so pens should be of concrete or kept as clean as possible to reduce the chances of infection.

Mixing of Formalin

Ten per cent. formalin (1 part of formalin to 9 parts of water) is used for all convalescent or infected sheep.

Five per cent. formalin (1 part of formalin to 19 parts of water) is used for clean sheep.

Between 150 and 200 sheep will use 10 gallons of formalin mixture, depending on how much is saved with a concrete apron as the formalin drains off the sheep's feet.

Baths should be emptied out and recharged daily, because they need cleaning; also if a bath of the same size as that at Purua is used, only 8 to 10 gallons is needed to recharge it. Care should be taken to watch that the solution is not diluted with rain-water; evaporation is not a problem, as the water evaporates more quickly than the formalin and thus effective concentration is maintained. However, the daily recharging in a normal day's work counteracts evaporation.

In the layout of footbaths consideration should be given to the provision of a concrete tub to hold, say, 40 gallons of water in which the desired 5 per cent. or 10 per cent. solution can be prepared and held. This fluid can then be siphoned or piped to the trough and run in as required to maintain an effective level. This saves frequent stops for mixing and recharging.

Care should be taken in handling formalin, as it has the power of fixing protein and will harden skin brought into contact with it. Rubber gloves could be worn. Also, sheep walking through the footbath are very prone to give a kick as they leave, splashing formalin backward, and this should be guarded against, as formalin can be painful if splashed into the eyes. Though painful, this disability is only temporary.

Frequency of Treatment

Infected and convalescent mobs should be put through a footbath of 10 per cent. formalin for 3 consecutive days after paring, and then at least weekly until the next inspection.

Clean mobs should be footbathed in 5 per cent. formalin as they go into clean paddocks, and re-treated only if this can be done with the minimum risk of re-infection; though whenever sheep are brought into the yards it would be preferable to run them through the footbath as they leave.

Time between Inspections

If sheep are examined too soon after paring, particularly if the paring has been severe, it is often difficult to differentiate between a recent cut and an infection. Three weeks between inspection gives the foot time to heal and new tissue to grow again.

Occasionally, if the paring is frequent and severe, new tissue growth may be delayed and the animal may be lame for an extended period. Care should always be taken not to pare unnecessarily or to cause unnecessary bleeding as long as no infected tissue remains.

The Flock

In any flock the first animals to be examined and treated should be the rams, because these must be ready for service when required even if the treatment of the ewe flock is not completed. It has been shown that rams with foot-rot have a lowered fertility.

Clean rams can be run with an infected mob of ewes at the risk of infection, but it would be unsound practice to put infected rams into a clean mob of ewes.

The size of mobs of ewes is immaterial as long as there is sufficient food. If eradication is started after weaning, it does not matter if the ewes are a little short of feed until flushing starts. The important part is to spell sufficient paddocks. Mobs which need repeated footbath treatment should be held in paddocks near the footbath for convenience.

FOOT-ROT ERADICATION . . .

Lambs, or hoggets which need special feeding, should receive preferential treatment and not be run in a mob with the ewes.

If wet weather threatens, it is preferable to hold sufficient sheep under cover to keep the labour force employed, though with cradles wet sheep can still be examined and treated if necessary. In dry weather or where sheep are held for too long on the boards, sheep's feet dry and harden and so become more difficult to trim. When the grass is wet mobs can be walked through wet grass and then not held for longer than 3 hours before paring; or in dry weather they can be held for 5 minutes in a special pen containing 1in. of water before being brought into the shed. Because moist feet are so much easier to pare, this is a factor worth considering, as soft feet will enable more efficient work and a higher sheep-per-man output.

First Aid Precautions

First aid equipment, such as bandages, cottonwool and disinfectant for cuts, should be provided.

An eye splashed with formalin should be immediately washed in a basin of clean, cold water or in water poured from an old teapot set aside for the purpose.

All operators should be vaccinated against tetanus. This should be a normal practice for all farm workers, as tetanus is very common in stock on some farms, with a corresponding risk to humans.

Cost of Labour

As the greatest cost in an eradication scheme such as that described is for labour, every effort should be made to reduce this charge. Organising should be begun well beforehand so that the labour team is kept fully employed, is well supplied with equipment, and has good working conditions.

The supervisor should make sure the paring is done efficiently so that there are few return sheep and the scheme will finally give a high sheep-per-labour-hour turnover.

Footbathing and isolation should also be efficient to increase and then maintain a high percentage of cures.

Control of wandering stock, newly purchased stock, goats, and trucks used for transporting sheep should be watched very carefully to avoid re-introduction of the infection, because a breakdown will mean a repetition of all the work.

Two months are sufficient for a clean mob to become heavily infected once re-infection is introduced.

Foot-rot in sheep can be eradicated and should be organised on an area basis to obtain an efficient labour force and good disease control.

Easily Handled Raddle for Sheep Marking

THE generally accepted method of marking sheep for identification is by the use of raddle, which is obtained in various colours. Too frequently sheep are plastered with raddle, which also gets on to the man handling it, particularly in damp weather. The raddle stick will last much longer, is not broken if dropped, is much more convenient and pleasant to handle, and will make a more defined mark on the sheep if the precaution illustrated is taken.

About 8in. of used bicycle tubing is rolled over the stick of raddle. This is best done by sliding the tubing over a shovel or broom handle and rolling it back on to the full length of the stick of raddle, leaving plenty to cover one end. The rubber can be pulled back or cut off as the raddle is used.

—B. L. GRINDELL, Livestock Instructor, Department of Agriculture, Wairoa

Book Review

"Citrus-Growing in Australia": F. T. Bowman

THIS book presents a concise but comprehensive review of all phases of citrus growing. Though it is written for Australian conditions, much of it has direct application to citrus growing in New Zealand.

Its information is up-to-date and considers varieties, rootstocks, propagation, climate and soils, design and development of an orchard, planting, mineral nutrition and fertilisers, soil management, irrigation, pest and disease treatments, pruning, harvesting, storage, and preparation of the fruit for market.

Varieties, species, and hybrids of citrus are dealt with rather briefly. Emphasis is placed on their cultural value and qualities, not all of which of course apply to New Zealand conditions. Technical descriptions are omitted. An inaccuracy occurs in this section on page 20 under the heading "Seville Orange Hybrids", where the Poorman orange (New Zealand grapefruit) is discussed and it is suggested that New Zealand-grown Poorman oranges are identical with Ugli tangelos from Jamaica. The Ugli fruit has become quite well known on the New Zealand market in recent years and it would be difficult to find anyone in New Zealand who would agree with this view. The New Zealand Poorman is more bitter and grapefruit-like in flavour than the mandarin-flavoured Ugli. It also lacks the characteristics of easy peeling and easy separation of sections of the Ugli. Moreover, foliage and tree characteristics of the Ugli show distinct differences from those of the Poorman.

By providing a compact summary, plainly presented, of much of the latest information available on citrus growing, Dr. Bowman's work should make a very useful reference handbook for New Zealand citrus growers.

—W.A.F.

Angus and Robertson Ltd., Sydney. 63s.

Californian Laying Cages and Open-sided Poultry House

▲ Californian-type laying cages with a water trough running the length of each row of cages and fixed above the food trough. This is the alternative watering system to the nipple-pipe system shown in the illustrations on pages 569 and 573.

THE system of keeping laying birds in laying battery cages has been used overseas for many years, but only in the last year or two has it received serious attention from commercial egg producers in New Zealand. Two different types of equipment are in use—one that is commonly used in the United Kingdom and one which has originated from the United States of America and is termed the Californian laying cage system. In this article M. Sutton, Poultry Instructor, Department of Agriculture, Dunedin, describes the Californian laying cage system, including the type of house used for these cages.

THE Californian laying cage has been used in California for well over 10 years. It was developed there following the use of the earlier types of three-tier designs and has spread widely to many other areas in the United States and other countries. It is now in use in Canterbury.

Californian-type cages are manufactured in basic units 6ft. wide by 18in. deep by 18in. high. This unit can then be partitioned into compartments of desired size, the usual design being eight cages each 9in. wide. These partitions add greatly to the strength of the unit when it is fixed into place. The unit is constructed of heavy-gauge wire mesh; the floor extends 10in. past the cage front and is sloped enough to enable eggs to roll forward and come to rest against the upturned wire lip which forms the egg cradle.

Two types of watering systems, a V-shaped trough and an overhead drip-valve system, are available. The drip-valve system supplies clean water. It consists of a pipe running the length of the unit, usually at the back of the cage. This water pipe can be on the outside of the unit so that the hens must reach through the wire mesh to drink, or it can run through the cage. Drip valves or drinking nipples are installed the length of the water pipe and so spaced that one nipple serves two birds.

A fairly low water pressure is required for the drip-valve system. A cistern with a float valve to control the supply from the domestic water service is all that is required. The level of the water in the cistern should not be more than 10in. above the level of the drinking nipples.

The V-shaped trough is simple to install, but a disadvantage of this system is that some effort is required to keep the trough clean and level.

Metal feeding troughs the length of one unit are manufactured. These are fitted on the front of the cage so that

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the eggs can roll under them into the egg cradle. Both edges of these metal troughs are turned inward so that food wastage is reduced to a minimum.

Housing and Installations

The Californian-type house is best described as a long, hip-roofed shed supported on each side by studs set in concrete blocks. The approximate height of these studs is 6ft. Both sides of the hip roof usually measure about 8ft. 6in., rising to a peak 8ft. from the ground. Roofing is designed to give an overhang of 2ft. to 3ft., which provides shelter for the birds from sun and rain. If iron roofing is used, it is necessary to place some form of sarking material close to the metal to prevent condensation in cold weather and to reduce temperature in summer.

The house should, if possible, lie north to south, but as it is so open, this consideration will be governed by availability of shelter from prevailing winds, whether hot or cold. Layers will not produce satisfactorily when they are exposed to wind, and it is advisable to provide some protection. Windbreaks of hedges, belts of trees, spaced palings, or hinged frames can be satisfactory, but should not interfere with air circulation in hot weather.

The width of the house from stud to stud is controlled by the method used to install the laying units. Several combinations of single or stepped rows are suitable for commercial farms. There are many ways to install the units, the two most popular being the brace method and the peg method.

Where the units are supported by angular metal braces bolted to the studs the required width of the house from stud to stud is 11ft. This allows for a 3ft. 6in. concrete path down the middle of the house, and the laying units are placed in two stepped rows on each side of the path and facing the centre of the house. The upper tier is placed to the rear of the lower so that the droppings clear the lower cages. Installed in this manner, 96 units will require a shed about 150ft. long, which will accommodate 768 layers in individual 9in. cages.

CALIFORNIAN LAYING CAGES

An open-sided house containing Californian cages and with a windbreak at one side to protect the birds from excessive draught.

▼ Part of an open-sided house. Along the top of each row of cages is a water pipe with a nipple to each two cages. The heavy growth of vegetation will prevent drying of droppings and is undesirable.

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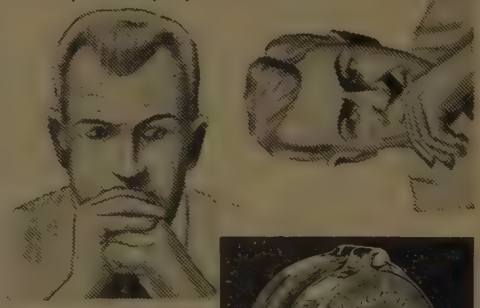

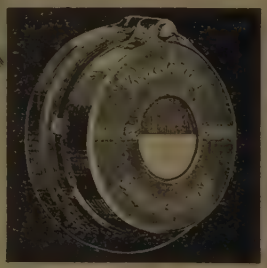

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A unit of cages fixed by the brace method. Artificial lighting is used in autumn and winter.

When the peg system of support is used the width of the house from stud to stud may be 8ft. Metal pegs ½in. in diameter are tapped through the studs, leaving sufficient of each peg protruding on each side to support the cage units. The diagram shows that the top peg supports the weight of the unit, and that the bottom peg is placed to counteract the weight of the bird in the cage. When the peg method is used the upper tier of units, with the exception of the egg cradle, is positioned on the outside of the studs.

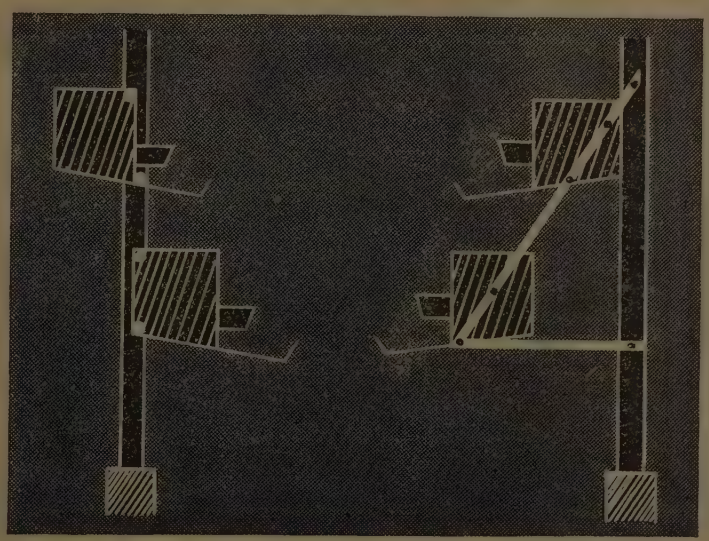
Another method is to support the units by wire from the rafters. This has disadvantages if a mechanical feeder is installed.

The incorporation of a feed shed and egg room at one end or in the middle of the house is an advantage, saving time and labour.

Where the drip-nipple watering system is installed in districts subject to heavy frosts the valves invariably freeze and do not thaw out until mid-morning. Wrapping the waterpipe with an electrical heating cable gives effective protection. Another method used to prevent freezing is to place a petcock at the end of the pipeline to drain the system or to provide a continuous flow of water.

With earlier designs of this laying cage it was necessary to remove the food trough to remove the bird from the cage. Now that the units are manufactured with a sliding door to each compartment farmers are interested in a food trough running the entire length of the cage system. This would be a great advantage where a mechanical feeder is installed.

The house should be electrically wired so that artificial lighting can be provided during autumn and winter. This is necessary to maintain egg production when the hours of daylight are shorter. A minimum of 13 to 14 hours of total light should be provided in each 24-hour period.



The peg method of fixing cages.

The brace method of fixing cages.

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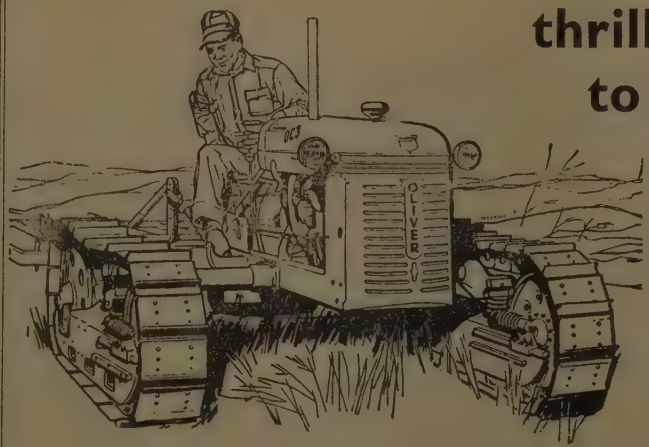

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Another method of fixing cages is on wooden supports. Here each feed trough has a lip on the outside edge to prevent wastage of food. Down the centre between the two upper rows of cages is a waterpipe with nipples. The lower rows have a pipe each.

Droppings

With this type of laying cage the droppings fall through the wire mesh floor on to the ground, where they should be allowed to cone up until they are removed. As wet or damp droppings provide a breeding ground for flies, it is essential to ensure that the manure is kept dry. To prevent dampness sufficient roof overhang is required to keep the rain off the droppings. It is also essential to prevent leakage from the water system, to feed a non-laxative diet, to have a free circulation of air, and to prevent weeds and long grass from obstructing the sun.

Management

Success on any poultry farm depends on the ability of the operator to rear healthy pullets as replacement stock. Pullets for laying cages can be reared on range, in confinement, or entirely on wire. In the cold winter months it is essential to harden off replacement stock before placing them in cages in an open house.

Feeding is a most important factor with any poultry unit, but more so where birds are kept in cages. Layers in cages must be fed a complete ration, as they have no opportunity to supplement it. The food must be palatable, adequately balanced, and sufficient to satisfy the needs of the birds. A dry mash mixture is popular, but must always be as fresh as possible. It is good management to let the birds clean out the troughs every few days to prevent food becoming stale or mouldy. When food is available to the layers at all times they tend to lose appetite and a drop in production and body weight may follow. Daily levelling or distributing of the mash in the troughs stimulates the interest of the birds, keeping the food intake high.

Oyster shell and insoluble grit may be sprinkled on the mash in the trough every few days or can be included in the mash mixture. Insoluble grit aids in the assimilation of both food and oyster shell.

One of the biggest advantages of the laying cage is that accurate egg records may be obtained with the minimum of labour. There are many methods of recording eggs, some of which are chalking the food troughs, clipping the pegs on the egg cradle, or keeping record cards for each unit of birds. Provided these records are kept accurately, the non-producers can be marketed at the earliest opportunity and their cages refilled by replacement stock. The slow or pausing producer is eyed with suspicion, but good judgment is necessary in culling, as some layers often pause, sometimes for 3 weeks, and then recover to lay large numbers of eggs.

(Continued at foot of page 575)

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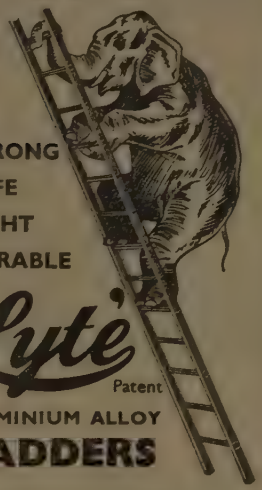

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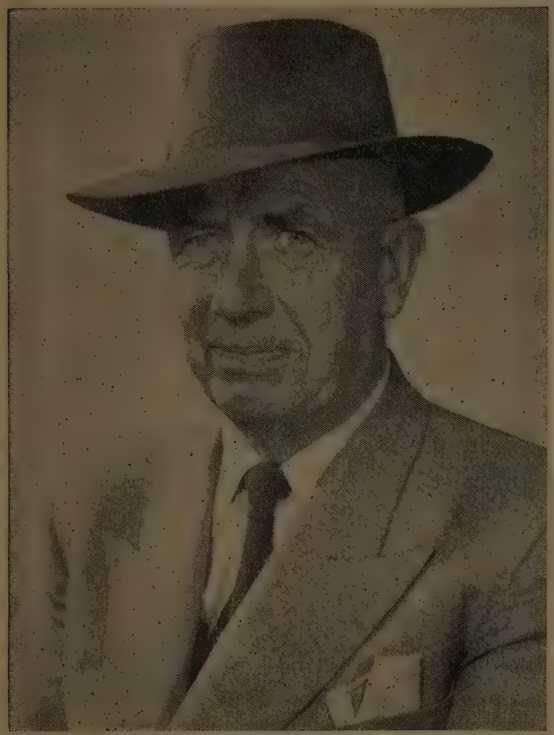
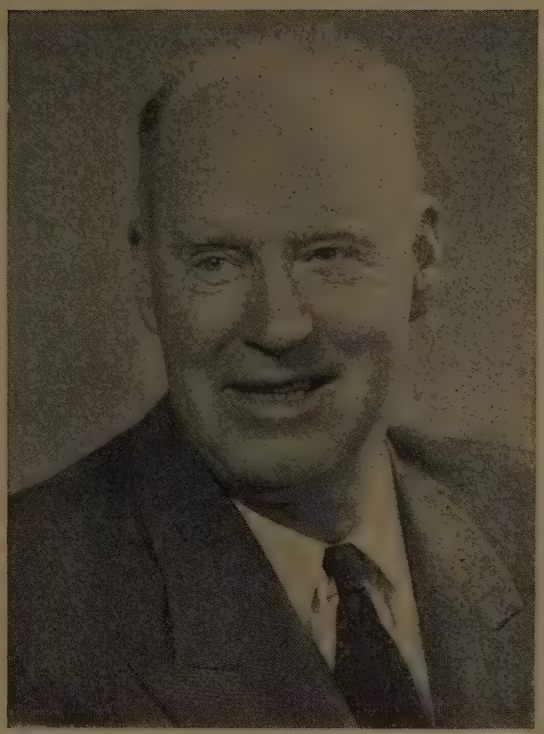


Mr. R. B. Tennent, Deputy Director-General, formerly Assistant Director-General.

Mr. Tennent has been Assistant Director-General since 1943, when he was promoted from the Directorship of the Fields (now Extension) Division. Before that he had been Fields Superintendent at Dunedin. He was appointed Deputy Director-General in April last and has been Acting Director-General during the absence of the Director-General, Mr. E. J. Fawcett, with the Trade Mission to Britain. Mr. Fawcett will retire toward the end of this year.

Mr. Smallfield joined the Department as Assistant Instructor in Agriculture, Auckland, in February 1921. He was appointed Fields Superintendent, Auckland, in 1928, became Superintendent of the Ruakura Animal Research Station in 1939, and Superintendent of Services Vegetable Production in May 1942. The following year he became Director of the Fields (since 1948 the Extension) Division.



Mr. P. W. Smallfield, Assistant Director-General in succession to Mr. Tennent, and formerly Director, Extension Division.

Mr. Smallfield visited Pakistan in 1951 to advise on the establishment of a livestock feeding project there which is part of New Zealand's commitments under the Colombo Plan. In 1955 he studied agricultural extension work in England, Scotland, and several states of U.S.A.

He is an acknowledged authority on agricultural research and extension and has written extensively and delivered many papers on these subjects.

Mr. Smallfield is a member of the consultative committee on agricultural education. He is the Director-General's representative on the Land Settlement Board and Marginal Lands Board, the Department's representative on the Inter-Departmental Committee on Irrigation, and member of the Dominion executives of the Federations of Young Farmers' and Country Girls' Clubs.

Californian Laying Cages

(Continued from page 573)

Parasites and Vermin

Before stock is placed in the cages it is essential to ensure that all birds are free from intestinal worms and body lice. Lice can become a serious problem, as they breed quickly and can spread through the entire cage system if allowed to go unchecked. Caged layers can be infested by red mites, which live either on the wire mesh or on the feathers of the birds.

In some areas sparrows are a problem. They act as hosts for feather mite and lice and could easily start an infestation among clean layers. Droppings from sparrows cling to the wire floors of the cages, thus fouling the eggs as they roll into the egg cradle. Control of this trouble is important for food economy, and the most satisfactory answer is to wire in the sheds with wire netting which will make them sparrow proof.

Cost

The cost of installing the Californian laying cage system depends entirely on the operator. Laying units are manufactured complete, but where cost must be reduced to a minimum they can be bought without metal feed troughs and watering systems.

The open-type house is of extremely simple design and should not prove difficult to build. However, where cost is not the primary consideration, prefabricated houses manufactured in galvanised steel can be bought ready to erect.

All photographic illustrations by Green and Hahn.

Care of Livestock during July

Contributed by the Animal Research Division

PULPY KIDNEY IN LAMBS

WHERE pulpy kidney occurs in lambs under 6 weeks of age its incidence can be reduced by vaccinating the ewes before lambing. If ewes have never been vaccinated, best results will be obtained from two doses of vaccine given at least a month apart. Ewes which were vaccinated last year will require only one vaccination. The last (or the only) vaccination should be given about a fortnight before lambing and this can be done quite safely if ewes are handled carefully. Very poor immunity results where the ewes are vaccinated much earlier. If most losses from pulpy kidney occur in lambs over 6 weeks of age, vaccination of ewes is of no value, but vaccination of lambs at marking, with a second dose later, may help.

BLOOD POISONING IN EWES AND LAMBS

Losses from blood poisoning in lambing ewes and marked lambs can be greatly reduced, if not eliminated, by vaccinating the ewes with blackleg vaccine about a fortnight before lambing. As the immunity which passes from the ewe to the lamb in the first milk does not persist for many weeks, lambs should be marked early. To obtain the best results it may be necessary to divide the ewes into early and late lambers, which should be vaccinated separately before lambing.

Advice concerning vaccination can be obtained from any office of the Department of Agriculture. Where possible ewes should lamb in clean spelled paddocks, and lambs should always be marked in clean temporary yards. Sometimes losses from blood poisoning occur in lambing ewes that have not been vaccinated. If losses are occurring, it is too late to vaccinate. It may be possible to save some ewes by treating them with penicillin, if the penicillin is used early enough. It is important that blood poisoning should be confirmed, and the local veterinarian should be consulted. After such confirmation all ewes which are assisted in lambing should be treated by penicillin injection. This should be an emergency measure and should not replace vaccination, which is the cheapest and most certain means of preventing blood poisoning.

SLEEPY SICKNESS IN EWES

Heavy losses from sleepy sickness sometimes occur in ewes carrying twins or heavy single lambs. These losses may be prevented by ensuring that ewes do not suffer a check just before lambing. If necessary, they should be divided into early and late lambers and drafted on to the best feed available 3 to 4 weeks before lambing. Research has shown that poor feed for 5 weeks before lambing can reduce the fleece weight by more than ½lb.

RINGWORM IN CALVES

Ringworm in calves is sometimes troublesome, especially in poorly nourished calves. Before any remedy is applied the scales should be removed by rubbing in a mixture of equal parts of soft soap and lard and scraping off the softened scabs the next day. The bare patches should then be dressed with an ointment consisting of 1 part of salicylic acid and 8 parts of lard, or any registered stock remedy for ringworm which is available. As the infection can be transmitted to man, it is wise to wear rubber gloves when treating ringworm. In any case the hands and arms should be washed thoroughly immediately after the dressings are applied.

ERGOTISM IN CATTLE

Hay made from ergotised grass will cause lameness and sometimes even loss of feet in cattle. The small black ergots which replace the seeds of ryegrass and other grasses can be easily seen, and if they are present in large numbers, the hay should not be used. Similar trouble often occurs when cattle are grazed on tall fescue grass, even when no ergots are present. This grass should be regarded as poisonous and should not be grazed by cattle.

WINTER FEEDING OF COWS

It is imperative that cows should be well fed for 6 to 8 weeks after calving. They should have access to hay at all times, and if the pasture is poor, they should also receive up to 20lb. of silage per day. Early calving cows should be given about 2 hours' grazing per day on autumn-saved pasture and in addition should be fed as much silage as they will eat.

MILKING METHODS ARE IMPORTANT

At the start of a new season cows should be trained to let down their milk quickly and completely by the establishment of a fixed milking routine, so that the cows are brought into the shed, bailed up, washed, and milked in the same way at each milking. Anything which upsets the cows must be avoided. A brief but vigorous wash followed by the withdrawal of a squirt of milk from each quarter into a strip cup is the best method of stimulating the flow of milk. This will also help in detecting cases of mastitis early.

As the duration of let-down is limited, cups should be put on immediately after the washing and starting process. A good milk flow indicator should be used and as soon as this shows that milk flow is slowed to ½lb. per minute the cups should be pulled down until milk flow again falls to this rate, when they should be removed at once. Massaging of the udder while the cups are pulled down should be practised only with cows which are known to need it.

Dairy Produce Graded for Export

THE following figures showing quantities of dairy produce graded for export during March and for the 8 months ended 31 March 1957, with comparative figures for the same month and 8 months of 1955-56 have been compiled by the Dairy Division of the Department of Agriculture from figures supplied by divisional officers at the various grading ports:—

BUTTER

Period	Creamery (tons)	Whey (tons)	Total (tons)	Percentage Inc. or dec.
March 1957	9,132	254	9,386	—
March 1956	12,846	265	13,111	—
Increase or decrease ..	—3,714	—11	—3,725	—28.411
8 months ended 31/3/57	139,147	2,515	141,662	—
8 months ended 31/3/56	148,228	2,569	150,797	—
Increase or decrease ..	—9,081	—54	—9,135	—6.058

Butter in store at 31 March 1957 was 26,126 tons

Note: In addition to the butter graded for export 1,576 tons of ice cream base were graded for export at Auckland.

CHEESE

Period	White (tons)	Coloured (tons)	Total (tons)	Percentage Inc. or dec.
March 1957	7,141	858	7,999	—
March 1956	7,060	1,639	8,699	—
Increase or decrease ..	+81	—781	—700	—8.047
8 months ended 31/3/57	68,177	9,256	77,433	—
8 months ended 31/3/56	66,837	11,821	78,658	—
Increase or decrease ..	+1,340	—2,565	—1,225	—1.557

Cheese in store at 31 March 1957 was 26,868 tons

If these figures are converted into butterfat equivalent, there is a decrease of 5,201 per cent. in butterfat graded for the 8 months as compared with the corresponding period of the preceding season. The above figures refer only to butter and cheese graded for export, and owing to diversions which may take place from time to time they are not necessarily a true indication of production trends.

Crop and Pasture Production

Seasonal Notes by the Extension Division

PLANS for seed-bed preparation for the spring and early summer sowing of root and forage crops should now be considered. On dairy farms where pig production is an important sideline roots are very useful.

FODDER BEET

FODDER beet is a particularly useful crop for winter feeding of pigs. The crop is best taken after grass and will respond to careful seed-bed preparation and adequate manuring. Where weeds are very troublesome and the rainfall high transplanting instead of direct sowing is often practised.

—B. T. JORDAN

* * *

CONTROL OF GRASS IN LUCERNE

VERY early spring is the only time when weed grasses can be effectively eradicated from lucerne stands by recently developed chemical methods. Various cultivation practices have been tried in the past, but weed control has seldom been effective. The chemicals now available are sufficiently selective to remove grass weeds without damaging the lucerne, provided they are applied at the prescribed rates and at the correct time.

Dalapon has proved most effective and least likely to check the lucerne. As it is absorbed through the foliage, it should be applied when the lucerne is dormant or defoliated but the grasses are showing young, vigorous growth. Treatment during settled weather will allow maximum leaf absorption by grasses and avoid washing off of the dalapon into the soil, where root uptake could temporarily check the lucerne.

This restricts the time of application to the very limited period in early spring when grass is showing growth but lucerne is still dormant.

Application rates vary in relation to the type of grass weeds present, but 5lb. of dalapon per acre generally gives good control, and up to 10lb. applied correctly will not harm the lucerne. Where annual weed grasses are present the inclusion of 5lb. per acre of TCA may prevent re-establishment from seed, but TCA is more likely to check temporarily the lucerne.

OVERSOWING TUSSOCK COUNTRY

Conditions vary greatly throughout the medium- and high-rainfall South Island tussock country, but on better-class silver tussock areas where some low-producing clovers are present there should be no difficulty in establishing high-producing strains of white clover and Montgomery red clover by aerial sowing with 1½cwt. to 2cwt. per acre of reverted superphosphate, with molybdenum where this is deficient. Winter and early spring seeding will make best use of the cultivation effect of frost action and should ensure establishment before the drier summer.

On less fertile, more acid, hard tussock country, where even low-producing clovers are non-existent, aerial sowing has been disappointing. Here some lime appears to be essential, and inoculated clovers drilled mechanically with fertiliser on limed areas have established well. Inoculation of seed with nodule-forming, nitrogen-fixing bacteria has greatly improved establishment, and trial work in Otago indicates that the use of inoculated seed with a reverted superphosphate-lime-molybdenum mixture may bring success to aerial sowing of these more difficult areas. Application of 1½cwt. to 2cwt. per acre of reverted superphosphate plus lime and molybdenum is necessary at sowing and a similar amount of phosphatic fertiliser is essential within the first year.

—S. M. J. STOCKDILL

* * *

GRAZING MANAGEMENT FOR SEED PRODUCTION

CAREFULLY controlled grazing of new ryegrass stands is necessary to obtain a balanced sward and a high seed yield in the first year. As with any new grass winter poaching in wet weather is undesirable. Short-rotation and Italian ryegrasses will stand closer and more frequent grazing than will perennial ryegrass, which should not be grazed more closely than 2in. to 3in. Large mobs for short periods are better than small numbers for long periods and give a more even grazing. Older ryegrass areas intended for seed will stand heavier grazing, but as they are usually associated with white clover, winter and early spring grazing management will largely determine which seed crop is taken. For white clover seed close and more continuous grazing in winter and early spring will keep the grass under control, allowing the white clover to become the dominant species. For ryegrass seed grazing the stand not lower than 2in. to 3in. will result in a balanced mixture of grass and clover which will allow the ryegrass growth to become dominant in spring. Of course much wet weather after shutting up may finally determine which type of seed is taken.

—P. R. BARRER

* * *

FARM DRAINAGE

WINTER is a good time to have a look at farm drainage problems and to make plans about tackling them. There are many ways of getting rid of surplus water harmful to crops and pastures, but selection of the best way for any particular conditions is not always easy. Tile drainage, the most costly method, may well be the best in the long run, because tile drains, when well planned and properly installed, are most effective, last indefinitely, and require little maintenance. The last-named factor is specially true when the problem is the drainage of silts and loams on flat land. Where the subsoil is stiff and impervious and there is a good fall mole drains are much cheaper and also more effective than tiles, but lines of tiles should be used in conjunction with the mole drain system in places where there is not enough fall for the moles to last and work well.

Properly sited cut-off drains can be used very effectively where the cause of the trouble is spring or seepage water coming from higher ground on to flat areas. Such drains must be deep enough to do the job and are best covered to reduce maintenance. On sandy and peaty soils where neither underground nor the usual open drains will last the wide, shallow, grassed V drain is the best method of dealing with surplus water, and on steeper sidings of rolling country, where mole draining is difficult, contour furrows leading to grassed waterways down the slopes are proving very effective in keeping such areas dry in winter. Whatever the drainage problem is, the selection of the best method of tackling it and, in many cases, careful planning of the work are really important, as mistakes in drainage can be very costly.

Farmers are recommended to seek the advice and assistance of the Extension Division, which has several specially trained drainage officers available for this work.

—K. MAYO

Certification of Legume Seed Inoculants

By G. H. CUNNINGHAM,
Director, Plant Diseases Division, Department of Scientific and Industrial Research, Auckland

THE inoculation of lucerne seed with root nodule bacteria has been considered good farming practice for many years, and the Plant Diseases Division of the Department of Scientific and Industrial Research has been supplying cultures in steadily increasing amounts over the last 28 years.

RECENT research work in New Zealand has shown that the establishment and growth of clover are greatly assisted by inoculation with an efficient clover culture. Inoculation is of particular value in virgin or second-class country where the soil often lacks nodule bacteria or contains only ineffective strains.

Nodule bacteria are able to "fix" atmospheric nitrogen and make it available to the legume host plants. As most legumes have a high nitrogen requirement, good growth depends on the presence of nodule bacteria unless the soil has a high nitrogen content.

During the past two seasons a number of commercial lucerne and clover cultures have come on to the New Zealand market and are now available from seed merchants. The Plant Diseases Division therefore decided to cease lucerne culture production and no cultures have been dispatched since the end of last season.

To provide farmers with information which will enable them to procure efficient tested strains of legume cultures a voluntary scheme for the certification of legume seed inoculants is being carried out by the Plant Diseases Division. At present only cultures for the inoculation of lucerne and red, white, and subterranean clover are being tested.

Farmers may purchase any culture certified by the Division and know that it has been thoroughly tested and found to be efficient for legume inoculation. Final success with such cultures depends on strict adherence to manufacturers' instructions and the application of normal principles of good farm management.

Particulars of the certification scheme are available from the Director, Plant Diseases Division, Private Bag, Auckland.

A list of legume inoculants certified as at February 1957 by the Division is given at right.

Trade name	Manufacturer and/or agent	Carrier	Certified for:—
	CLOVER		
Agserv Inoculum B	Agricultural Laboratories Pty. Ltd., Sefton, Australia; Ivon Watkins Ltd., P.O. Box 124, New Plymouth, N.Z.	Peat	Red and white clover
Biolab C Agar	Biological Laboratories Ltd., P.O. Box 2749, Auckland	Agar	Red, white, and subterranean clovers
Biolab C Peat	Biological Laboratories Ltd., P.O. Box 2749, Auckland	Peat	
Glaxo Legume Inoculant	Glaxo Laboratories (N.Z.) Ltd., P.O. Box 624, Palmerston North	Peat-pumice	Red, white, and subterranean clovers
Inoculaid C Agar	Biological Laboratories Ltd., P.O. Box 2749, Auckland; Dalgety and Co. Ltd.,	Agar	Red, white, and subterranean clovers
Inoculaid C Peat	P.O. Box 1397, Wellington, and branches	Peat	
Inoculator C Agar	Biological Laboratories Ltd., P.O. Box 2749, Auckland; The Farmers' Co-operative Wholesale Federation N.Z. Ltd., P.O. Box 1124, Wellington, and farmers' co-operative organisations	Agar	Red, white, and subterranean clovers
Inoculator C Peat		Peat	
Inoculo 3	Inoculo Laboratories, 72 Victoria Crescent, Mont Albert, Melbourne, Australia; A. S. Paterson and Co. Ltd., 209 Cashel Street, Christchurch	Peat	Red and white clover
Legulon C Agar	Biological Laboratories Ltd., P.O. Box 2749, Auckland; Wright Stephenson and Co. Ltd., P.O. Box 1895, Wellington, and branches	Agar	Red, white, and subterranean clovers
Legulon C Peat		Peat	
Nitrogon C Agar	Biological Laboratories Ltd., P.O. Box 2749, Auckland; Pyne, Gould, Guinness Ltd., P.O. Box 112, Christchurch, and branches	Agar	Red, white, and subterranean clovers
Nitrogon C Peat		Peat	
Nodulaid B	Agricultural Laboratories Pty. Ltd., Sefton, Australia; N.Z. Loan and Mercantile Agency Co. Ltd., P.O. Box 1498, Wellington, and branches	Peat	Red and white clovers
Nodulaid C		Peat	Subterranean clover
Nod-o-Gen 2 in 1	The Albert Dickinson Co., Chicago, U.S.A.; Seed Inoculants (Nod-o-Gen) Ltd., P.O. Box 7, Ashburton, N.Z.	Humus	Red, white, and subterranean clovers and lucerne
	LUCERNE		
Biolab L Agar	Biological Laboratories Ltd., P.O. Box 2749, Auckland	Agar	Lucerne
Biolab L Peat		Peat	Lucerne
Glaxo Lucerne Inoculant	Glaxo Laboratories (N.Z.) Ltd., P.O. Box 624, Palmerston North	Agar	Lucerne
Inoculaid L Agar	Biological Laboratories Ltd., P.O. Box 2749, Auckland; Dalgety and Co. Ltd., P.O. Box 1397, Wellington, and branches	Agar	Lucerne
Inoculaid L Peat		Peat	Lucerne
Inoculator L Agar	Biological Laboratories Ltd., P.O. Box 2749, Auckland; The Farmers' Co-operative Wholesale Federation N.Z. Ltd., P.O. Box 1124, Wellington, and farmers' co-operative organisations	Agar	Lucerne
Inoculator L Peat		Peat	Lucerne
Inoculo 1	Inoculo Laboratories, 72 Victoria Crescent, Mont Albert, Melbourne, Australia; A. S. Paterson and Co. Ltd., 209 Cashel Street, Christchurch	Peat	Lucerne
Legulon L Agar	Biological Laboratories Ltd., P.O. Box 2749, Auckland; Wright Stephenson and Co. Ltd., P.O. Box 1895, Wellington, and branches	Agar	Lucerne
Legulon L Peat		Peat	Lucerne
Nitrogon L Agar	Biological Laboratories Ltd., P.O. Box 2749, Auckland; Pyne, Gould, Guinness Ltd., P.O. Box 112, Christchurch, and branches	Agar	Lucerne
Nitrogon L Peat		Peat	Lucerne
Nodulaid A	Agricultural Laboratories Pty. Ltd., Sefton, Australia; N.Z. Loan and Mercantile Agency Co. Ltd., P.O. Box 1498, Wellington, and branches	Peat	Lucerne
Nod-o-Gen 1	The Albert Dickinson Co., Chicago, U.S.A.; Seed Inoculants (Nod-o-Gen) Ltd., P.O. Box 7, Ashburton	Humus	Lucerne
Nod-o-Gen 2 in 1		Humus	Lucerne; red, white, and sub. clovers

WORK IN THE HOME GARDEN IN JULY

By A. G. KENNELLY,
Horticultural Instructor, Department of Agriculture, Dunedin

TEMPERATURE is one of the most important factors influencing growth, and though during sunny days in July air temperatures may be relatively high, in most districts soil temperatures are lowest during June, July, and August. Good growth may be made during periods of bright sunshine, but at other times the roots of any but the hardiest plants are unlikely to develop much. During this period roots are liable to damage from soil-borne organisms. In most districts sowing should be kept to a minimum and planting limited to the setting out of hardy, well-grown plants in situations where soil and climate are suitable.

SMALL sowings of such comparatively hardy plants as broad beans, silver beet or perpetual spinach beet, peas, spinach, turnips, and even carrots and radish may be made where climate and soil conditions are favourable. Lettuce and summer cabbage and cauliflower can be sown, though in less-favoured districts a frame or specially favourable situation is advisable. If cloches are used, all the seed mentioned can be sown in well-drained soil, but cloches should be in position about a week before sowing.

Hardy plants such as horse radish, spring cabbage, garlic, and shallots, and in North Island districts onion seedlings, can be set out if the soil is in good working condition. Where the weather is not too severe lettuce and cauliflower can also be set out, preferably in most districts late in the month.

Rhubarb and asparagus beds should be cultivated and manured. Where drainage is good and conditions are warm enough to enable the plants to respond liquid manure can be applied to soil needing fertiliser.

If soil conditions permit, the ground can be prepared for new beds of rhubarb or asparagus. Deep digging is desirable on most heavy or fine-grained soil, as it improves drainage and aeration, which is especially important in the production of early vegetables.

Tubers of Jerusalem artichoke can be sorted over and the small tubers planted in districts where the soil is in suitable order. Potatoes in store can be sorted over and rotted ones eliminated. Seed tubers can be treated with DDT if the potato moth is likely to be troublesome, but such treatment should not be applied to table potatoes. In early districts some tubers can be set to sprout for planting for a first crop.

When the soil is too wet to be worked the home gardener should turn his attention to jobs for which there is not always time in the busier gardening seasons. Soil and used seed boxes can be sterilised with a 2 per cent. formalin solution, tools can be sharpened and cleaned, and bins, shelves, garden seats, trellises, and benches can be built or repaired. Where necessary cloches can be cleaned, repaired, and assembled for use. Paths and drains can be installed or improved as advised in last month's "Journal".

Plans can be made for the forthcoming season's crops, special consideration being given to ensuring that each crop is succeeded by one of another family. Plans should ensure, too, that as far as possible gluts are avoided and plants appropriate to the capacity of the garden are available throughout the year. Only the varieties

Heading photograph by Sparrow.

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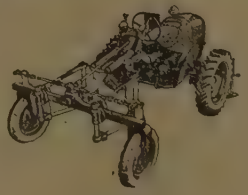

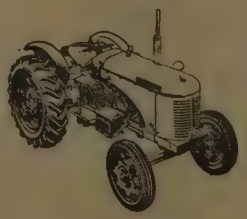

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most suited to the district, soil, and climate should be used.

Asparagus

New beds of asparagus are usually planted in August or in some southern districts September, but where the ground is reasonably dry it is possible to plant in July. Single rows should be about 48in. apart and the plants set about 18in. to 24in. apart in the rows.

The site should first be dug deeply and if necessary drainage improved by the addition of open material such as shingles or stones buried deeply in trenches, or by the installation of field pipes leading down to a lower level where excess water can drain away. All perennial weeds and grasses should be removed and material such as well-rotted stable or farmyard manure, compost, or strawy vegetation dug into the bottom spit.

Popular varieties of asparagus include Mary Washington (strain 500), Martha Washington, Connovers Colossal, and Paradise. K.B.F., a newer variety, is also claimed to be high yielding.

Broad Beans

It is not too late to sow broad beans. If a first sowing was made in autumn, a sowing made now will provide a succession for families who are fond of these beans. They do not need special soil, but it is not advisable to sow them in light soils which tend to dry out. They do well in fairly heavy, well-drained soil that has been well cultivated and into which has been dug a moderate amount of organic matter such as compost or well-rotted farmyard manure.

It is not too late to sow broad beans. If a first sowing was made in autumn, a sowing now will provide a succession for families who are fond of them. →

Heavy soil should be deeply dug, preferably some time before sowing. Though a small amount of potash is often beneficial, particularly on light soils or where disease is troublesome, the principal nutrient required on most New Zealand soils is phosphate. A dressing of 2oz. to 4oz. of superphosphate per square yard usually gives good results. In addition a small amount of nitrogenous fertiliser such as sulphate of ammonia or dried blood may be advisable on old, well-worked home garden soils that are lacking in organic matter and low in fertility.

Seed should be sown in double rows about 10in. apart with the seed placed diagonally 4in. to 6in. apart and 2in. deep in the bottom of a shallow trench or drill 3in. deep. Germination is usually good.

The main varieties are represented by types such as Broad Windsor and Mammoth Long Pod, but dwarf types having smaller beans (for example,

[Photos by Sparrow (upper) and Green and Hahn (middle and lower)

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the Sutton) are also available and are useful in exposed situations.

Cauliflowers and Cabbages

Seed of cabbage and cauliflower can be sown in July to provide heads for summer, or, in more favoured districts, for late spring or early summer use. A sunny, sheltered situation where drainage and tilth of the soil are good should be chosen. The seed-bed should be worked down to a fine tilth, and a light dressing of a complete fertiliser is likely to improve results on most well-worked garden soils.

Popular varieties of cabbage for sowing now include Greyhound, a small pointed type, Flower of Spring and Triumph, also pointed types, and the round-headed varieties Golden Acre and Green Acre. Popular hardy varieties of cauliflower include All Seasons, Walcheren, and Early London.

Leeks

Most growers make only one sowing of leeks, usually in August or September, though successional sowings can be made from July to September or, in the warmer districts, even October or November. A temperature of about 55 degrees F. is desirable, and in the colder southern districts the earliest sowing is sometimes made in boxes under glass.

Seed can be broadcast thinly outdoors in prepared well-drained beds and covered thinly or sown about ½in. deep in rows about 1ft. apart. Weeding, cultivating, and lifting are facilitated by sowing in rows.

Other factors being equal, growth depends largely on temperature and soil fertility. When sown in the comparatively cool conditions normal in early spring, plants are usually about 12in. to 18in. high in about 3 months and ready for setting out. Plants about 12in. long after trimming and about as thick as the little finger are preferable.

Plants may be obtained in most districts from seedsmen and nurserymen in December and January, but sufficient plants for the average-sized home garden can be raised by sowing a small packet of seed. Half an ounce of seed is sufficient for from about 50ft. to 100ft. of row, depending on how thickly it is sown.

Leeks can be grown in a wide range of soils that have adequate moisture, plant nutrients, and drainage. Deep, well-drained, highly fertile, easily worked soils are preferable. Growth is restricted in heavy, sticky soils, and in light shallow soils there may be insufficient soil for blanching and the roots may dry out and force early seed head development.

Very fertile soil is essential for good growth, and deep cultivation is advisable on most heavy, deep soils. Soils dressed preferably some time before planting with organic matter such as well-rotted stack bottom or stable or farmyard manure are excellent.

[*Sparrow*

It is not advisable to make any considerable sowings until the ground has warmed sufficiently for good growth.

Leeks are gross feeders, and whether or not organic manure is applied before planting, artificial fertilisers should be applied on most soils. Heaviest yields are usually obtained from well-rotted organic matter supplemented by artificial fertilisers.

Leeks are rarely troubled by pests or diseases, but mildew is occasionally troublesome. Regular spraying with copper sprays such as bordeaux or copper oxychloride gives fairly effective control.

Varieties

Most varieties of leeks give good results if well grown. Musselburgh is a very popular variety. Normally it has a longer and more slender blanched portion than other varieties. London flag matures earlier, but is generally considered to lack the quality of Musselburgh.

Cloches

Home gardeners who find the provision of early or late vegetables a problem can usually overcome the difficulty to some extent by using cloches. Cloches though not new have become popular with home gardeners only in recent years, when many types and sizes have become available.

"Cloche" is a French word meaning bell. The first cloches were bell-jars and the bell-jar type of cloche, either round or square, is still used fairly widely in Europe. Though numerous types of cloche are sold in New Zealand, even more are available in some European countries. They include semi-detached or twin-gable barn types, semi- or flat-gable cloches which may be used as frames and may be reversed for tall crops such as tomatoes and chrysanthemums, and cloches which are up to 5ft. high and may be up to 10ft. long. Much ingenuity has been shown in construction and measures to facilitate transport and access to crops and for ventilation.

In New Zealand cloche types are confined mainly to high and low tent cloches, high and low barn cloches, and flat-topped or lean-to cloches (sometimes called glass frames).

Cloches are an aid to plant production because they give protection against several degrees of frost and tend to keep up soil temperatures after a sunny day by reducing heat loss from the soil. They give protection against

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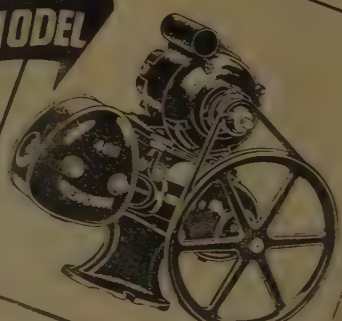

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the worst effects of winds without appreciable loss of light, but because of their comparative fragility it is advisable in exposed situations to place them securely and to keep the ends blocked with glass or wood to prevent strong winds from blowing them over and breaking them.

Wind affects horticultural crops greatly and few districts in New Zealand are free from cold or boisterous winds. For that reason the very high types of cloches which are in effect miniature glass houses are less satisfactory here than they appear to be in Europe.

Careful Handling Needed

The chief disadvantage of the glass cloche is its comparative fragility. Glass is very brittle and even the heavier grades, such as 24oz., are easily broken, particularly when not supported at the edges by a frame.

The ordinary cloche is held together only by wire and perhaps a single arched light iron rod with looped ends. However ingenious the arrangement it affords little protection for the sheets of glass forming the main parts of the cloche and not all gardeners can handle such material successfully. Those unused to handling cloches or lacking dexterity must always be careful.

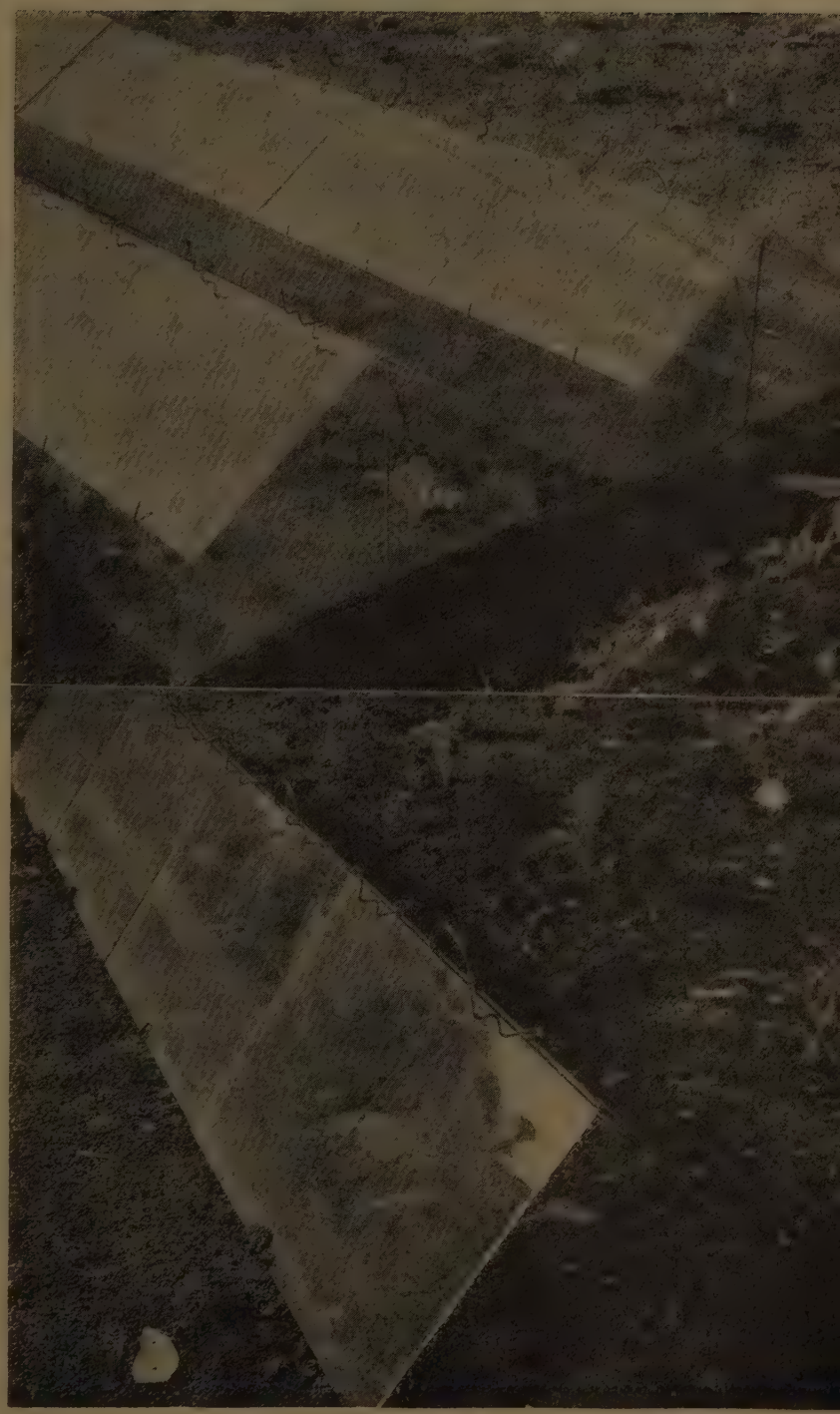
Special care must be taken when stones, large lumps of soil, timber, or tools are moved near a cloche. A slip of the hand or foot or a shovel, fork, or garden stake insufficiently driven into the ground that falls over may easily break several shillings' worth of glass.

Types

Modern cloches, which may be of glass, plastic, or similar material, provide continuous protection of plants in the row and are therefore usually referred to as continuous cloches. The tent pattern consists of two sheets of glass held firmly in position by a metal clip or block of wood or simple but effective system of wiring. The barn type is made up of four sheets of glass, usually held rigidly by wires, the lower two sheets forming walls and the upper two a gable roof. The flat-roof type consists of three sheets of glass, one for each side and one for the roof.

Ventilation is usually provided at the top by steps in the wire which holds the cloche together so that a pane or two panes may be moved apart in such a way as to allow air movement into the cloche.

Cloches of plastic, acrylic resin, or similar material are available. They have the advantage of being less



Cloches have many uses. They can be used for covering a succession of crops, for starting seedlings, or for maturing or curing or drying off produce. A good barn-type cloche (upper) and a tent type (lower), the simplest type, which consists of two sheets of glass held together by wire or a wooden or metal clip.

[*Sparrow*

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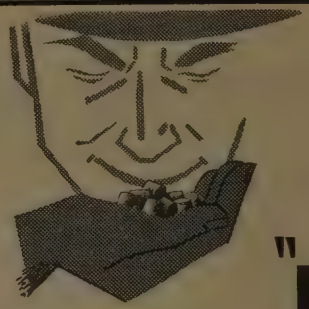

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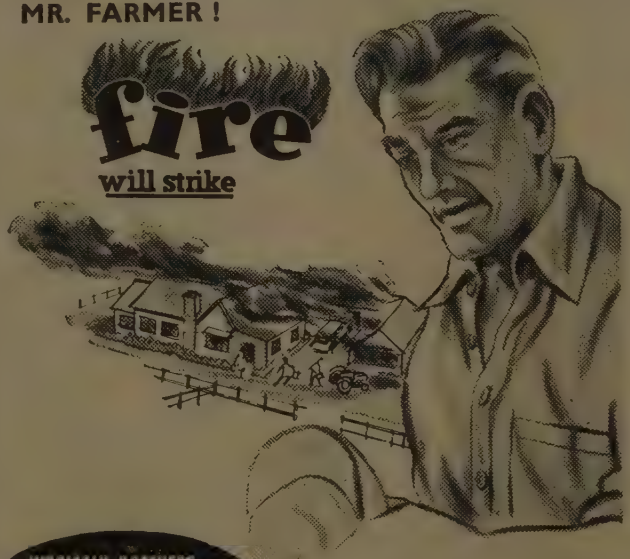

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readily broken than glass cloches, and some experimental work seems to indicate that for light transmission some types may have slight advantages over glass cloches.

Making Best Use of Cloches

Though the cost of cloches, particularly the barn type, deters many gardeners from purchasing them, it should be borne in mind that the cloche is not limited to one crop a year. A home gardener with a set of both tent and barn cloches can put them to many uses.

Advantages and Disadvantages of Cloches

The advantages and disadvantages of cloches may be summarised as:—

ADVANTAGES

1. Maintenance of higher soil and air temperature and humidity. Protection again several degrees of frost.

2. Protection from winds (which have a much more adverse effect on the growth of most plants than is usually supposed).

3. Protection against washing of the soil by rain, particularly for young seedlings. Protective sprays are not washed off by rain.

4. Plants under them are protected from most birds and small animals.

DISADVANTAGES

1. Unless great care is taken, particularly with glass cloches, breakages may be heavy. (Most home gardeners find it advisable always to be alert and careful in moving cloches and in working round them. Feet should be placed with care. Tools such as shovels, forks, and spades should not be stood in the ground near them, where they may be knocked or fall over on to the glass. Stones, bricks, heavy clods, hoes, and rakes should not be left lying near where they may be kicked or pushed against cloches. Care must be exercised particularly in hoeing near cloches. If they are to be stored, they should be dismantled unless they can be put in a place where they are unlikely to be damaged.)

2. Cultural operations, such as thinning, weeding, spraying, and watering, are usually more difficult under cloches than in the open.

3. Insect pests and some diseases are liable to be more troublesome in cloches, though this is largely a result of the improved growing conditions, such as increased humidity and temperature.

In the medium-sized tent type he can raise seedlings of all types in most districts in winter and spring, or he can grow early carrots, beetroot, lettuce, spinach, or even strawberries. With the barn type he can grow in addition to the crops mentioned, french beans, dwarf peas, potatoes, early cauliflower, cabbage, and broad beans and also force rhubarb or asparagus.

In summer he can use his tent type to grow carrots, beetroot, french beans, lettuce, and radish and his barn type to grow cucumbers, melons, marrows, and tomatoes.

In autumn he can grow successional crops of carrots, lettuce, onions, and spinach in the tent type. The barn type can be used for lettuce, onions, spinach, rhubarb, and french beans.

The barn type is specially useful for ripening late-maturing tomatoes, cucumbers, marrows, pumpkins, and melons. Onions can be dried and cured under cloches.

In winter almost all hardy seed may be sown if the cloches are placed in position about 10 to 14 days before sowing. Cloches can generally be used to start all crops and to mature most. It is generally recommended that rows should run east and west for early spring work and north and south for later-sown crops, though conclusive experimental evidence on this point is lacking.

On sloping land the rows should run across the slope rather than down it. The ends of rows should be closed, preferably with glass, and pegged down against wind. Where frosts are severe the cloches can be covered at night with straw or sacking.

Important Points

Care must be exercised in handling cloches and working among them. Water should not be applied within the cloche; the ground should be well watered before sowing and before the cloche is placed in position. The soil under cloches should be rich in organic matter such compost or rotted plant or animal residues. If the soil becomes dry, it is best to draw a channel along each side of the row of cloches and run water into this.

If fine seeds are sown under cloches and the weather becomes unseasonably hot, the ground above the seeds is best covered by sheets of paper until the seeds germinate. In hot weather it is best to allow the seed to germinate before the cloches are put in place.

Cloches may have to be shaded in hot weather, particularly in early summer and in autumn when crops such as tomatoes or cucumbers are being matured or pumpkins, marrows, and onions are being dried off and cured. Lime wash, either alone or with a little salt (hydrated lime should be used), distemper manufactured for interior use, or flour and water are satisfactory. Any of these substances may be sprayed, painted, or daubed on. Sacking or paper can be used, but is less satisfactory.

Ventilation is important in hot weather and the construction of most cloches allows some air movement where the panes abut. This is usually sufficient in cloches in rows in late autumn, winter, and spring, but during hot weather cloches may have to be spaced ½in. to 1in. apart in the row.

Several parallel rows of plants can be grown under the larger cloches. Generally 3 or 4 rows of root crop such as beetroot, carrots, or turnips, 2 rows of either dwarf peas or dwarf beans, or 2 or 3 rows of lettuce can be grown. The smaller, low, tent-type cloches are useful for germinating seed and getting seedlings established. Two rows of taprooted vegetables or a single row of lettuce can usually be covered by the smallest cloches.

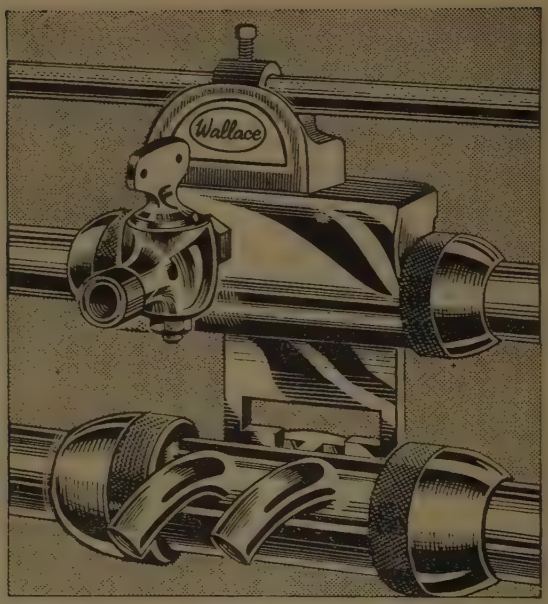
The main use for cloches in most home gardens is for growing early crops. Usually vegetables can be sown under cloches 4 to 6 weeks earlier than they can be in the open. Crops usually mature from about 3 to 6 weeks earlier, depending on the normal maturity period of the crop, the season, and the situation.

Annual Report of Department of Agriculture

THE Annual Report of the Department of Agriculture for the year ended 31 March 1957, containing reports of the Director-General and Directors of the Animal Research, Animal Industry, Dairy, Extension, and Horticulture Divisions and various industry accounts, is expected to be presented to the House of Representatives early in the present session of Parliament.

Copies may be ordered from the Publications Section, Department of Agriculture, Box 2298, Wellington, or from the Government Printer, Wellington. The price per copy will be approximately 6s.

Comprehensively indexed, the Annual Report should be of wide interest to all primary producers as a record of the research and extension services and activities of the Department.



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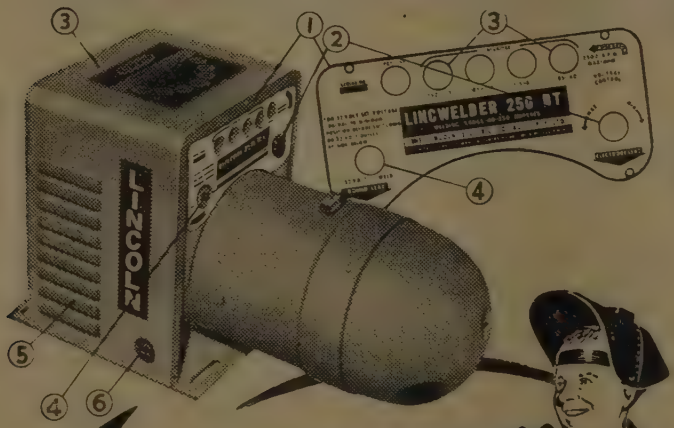

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Farm Building Construction

By H. W. T. EGGERS,
Engineer, Department of Agriculture, Wellington

THIS article is the third in a series about farm building construction and it deals with roofing materials. Next month's article will describe types of wall sheathings for buildings. The previous article in this series dealt with the construction of the framework of a building, which acts as a support for the sheathing and roof.

THE roof is probably the most important part of a building. To fulfil their function as a protection against sun and rain, materials used for roofing must have the following characteristics:—

A minimum of movement due to temperature changes.

No likelihood of cracking.

High resistance to weathering.

High degree of permanence.

Ease of maintenance and ability to shed water.

Types of Roofing Materials

The four main types of roofing materials available are as follows:—

Sheet roofing ..	(a) Metallic sheets: corrugated iron, corrugated aluminium, aluminium strip, treated steel either corrugated or flat
	(b) Asbestos cement sheets, large or small corrugations
	(c) Plastic corrugated sheet
Bitumen- or asphalt-saturated fabric (roll roofing)	(a) Plain fabric
	(b) Mineral-surfaced fabric
Tiles	(a) Clay tiles
	(b) Concrete tiles
Asphalt (built-up roofs) ..	(a) Plain asphalt
	(b) Built-up asphalt and impregnated felts

Choice of Material

Savings in constructional costs that can be effected by the use of some of these materials should be offset against the first cost of the materials themselves and should be considered in the choice of a type of roofing.

Other factors which must be weighed against first cost are durability (effective life) and frequency and cost of maintenance.

Generally the more expensive roofings are the more durable they are and the less maintenance they need. Sheet roofing and bitumen and asphalt roll roofing can be fixed by the layman, but tiles and built-up asphalt roofs require expert fixing.

Corrugated Iron

Corrugated iron is sheet steel in various gauges, corrugated and galvanised (zinc coated). As the zinc coating, which is provided to prevent rapid oxidisation of the steel, itself oxidises in time, corrugated iron needs a protective coating of paint to increase its durability. New material should, however, be permitted to oxidise slightly by weathering before painting to ensure a good bond for the paint. If immediate painting is necessary, artificial oxidisation can be carried out with the use of a suitable acid preparation.

Corrugated iron must be fixed with sealing head fasteners such as lead-head nails.

Corrugated Aluminium

The effective life and advantages and disadvantages of corrugated iron have been proved and are well known, but the general use of aluminium is rela-

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tively new. Aluminium roofs over 50 years old are in existence and evidence suggests that under equal conditions the effective life of aluminium would exceed that of corrugated iron. It has the same advantages and disadvantages as corrugated iron as a roofing material and greater care is necessary in its fixing to ensure that no other metal is in contact with it.

Sheets of aluminium alloy corrugated to the same dimensions as corrugated iron are available in various gauges.

Very thorough laboratory tests have been made of this material, which suffers pitting-type deterioration in weathering rather than uniform attack from which most other metals suffer. This pitting proceeds rapidly at first and then slows down, producing a self-stifling effect, so there is much more danger of perforation in thin sheets than in thick.

Installation

Aluminium is very susceptible to attack by galvanic action; it has been known to fail merely from contact with rain-water which has flowed over copper sheet before reaching the aluminium. For this reason the only metals which can safely touch the aluminium sheets are zinc or hot-dip galvanised iron.

The sheets should be fastened with aluminium nails or alternatively hot-dip galvanised nails. All saddles, brackets, spoutings, valleys, flashings, and similar parts must be of aluminium or hot-dip galvanised iron. Soft aluminium sheet only should be used for flashings.

Piercing the sheet with a drill or sharp steel probe before nailing is done will avoid denting of the surface with blunt nails. This drilling is especially helpful at the overlap of four sheets. A loose washer of soft aluminium or oil-resistant rubber under the head of the nail is a help in weatherproofing.

The slope of an aluminium roof is an important factor in removing moisture from the laps and so avoiding undue corrosion. A minimum slope of 3in. per foot is recommended. Ventilation of the space under the aluminium sheeting is also important. If there is any possibility of prolonged wet conditions without free access of air, it is advisable to give the under side of the sheets a coat of zinc chromate primer.

The sheets must not come into contact with wet cement or plaster and these materials are best weathered for a month or so and then protected by bitumastic paint and a layer of bitumen-impregnated paper before the aluminium is laid. Contact with green or resinous timber should also be prevented by a layer of tar-free, bitumen-impregnated paper. Alternatively the timber could be given a coat of bituminous or aluminium paint.

When sheets are bent along the lines of corrugations the bend should be so located as to continue the curvature of the corrugation. Do not scribe the bending line or restraighten or rebend the sheet, as such treatment may cause cracking.

A hay barn on which roll roofing has been used.

Painting Aluminium Roofs

For aesthetic reasons many users will prefer to paint aluminium roofs, and if this is correctly done, it will provide additional protection for the metal. Painting removes one of the advantages claimed for aluminium—that its brilliant reflection keeps the space beneath it cooler than that under a painted galvanised iron roof. Against this must be balanced the unsightly appearance of the polished aluminium roof and the fact that in a sea coast atmosphere the metal will in any case lose its lustre in time.

Painting the laps with zinc chromate primer before the sheets are laid is advisable. Both contact surfaces should be so treated.

To ensure good paint adhesion the metal should be cleaned and etched. This is best done before the sheets are fixed to avoid the chemicals used being trapped in crevices.

The Department of Scientific and Industrial Research has carried out extensive investigations with aluminium roofing and has published information concerning its use. It can advise about cleaning and etching.

Any specific queries on painting aluminium can be answered by the Paint Section of the Dominion Laboratory.

Collection of Drinking Water

Where rain-water is used for domestic purposes water from an unpainted aluminium roof is entirely suitable for human consumption. If the roof has been painted, it is advisable to wait until it has been well washed by several heavy showers before the water is collected for culinary purposes.

Effects of Destructive Agencies

Bird droppings: Apart from a slight surface roughening of the metal, bird droppings have no effect on unpainted aluminium.

Artificial manures: There is no risk of aluminium sheeting deteriorating seriously when used to roof sheds where superphosphate or agricultural lime is stored even when dust can rise and collect in the laps.

Lack of access of air: If aluminium roofing sheets are stacked in wet conditions so that free access of air to the surface of the sheets is prevented, they may undergo rapid pitting, which can cause perforation of the sheets in a few weeks. In single sheets freely exposed to the air this action does not take place. If lengthy stacking is necessary, the sheets are best placed on end and preferably oiled.

Effect of Timber on Aluminium Nails

Many green, sappy timbers are corrosive to aluminium, especially if it is in intimate contact with them without free access of air. It is therefore wise to use a greater number of

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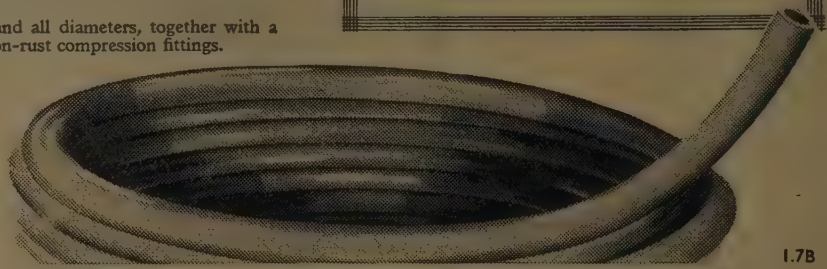

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aluminium nails than that required when normal lead-head nails are used; this number can be up to 25 per cent. extra unless the underlying timber is known to be thoroughly dry.

Contact with Rusty Galvanised Iron

Though new hot-dip galvanised iron is not affected by corrosive action through contact with rusty iron, aluminium in such a contact is likely to be pitted. Aluminium roofing sheets are therefore not recommended for the repair of deteriorated galvanised iron roofs.

Aluminium Strip

Both corrugated iron and aluminium are suitable materials for pitched roofs; aluminium strip can be used for both flat and pitched roofs. Aluminium strip of suitable gauge and fixed width can be factory cut to lengths to suit each order (within reason) and has therefore no horizontal joints. The only limitation to length is the "tailing out" space in the factory and difficulty of transport. For roofing, strips are fastened together with standing seam joints.

The strips are pre-formed, one beaded edge fitting over the turn-up of the next strip, and after the strips have been placed the bead and turn-up are folded over to make a welted joint.

Expansion and contraction of strips are provided for by anchoring in the middle, and fixing with sliding expansion clips at regular intervals toward the ends. No ridging is required, as the strips on both sides of a ridge can be folded and welted in a similar manner to longitudinal joints. Orthodox aluminium ridging can of course be used, but the edge of the strips is folded back to form a tray and no ridging nails must penetrate the strips, which must be free to expand or contract under the ridging.

Treated Steel

Treated steel sheets are either round corrugated in two sizes or V beam corrugated which are treated with permanent external coatings of asphalt and asbestos felt that keep all destructive agencies entirely away from the steel.

Flashings, ridge caps, corrugation closers, etc., are available in the same material.

This roofing is permanent and requires no underlay as a precaution against condensation. The sheets are fixed with screws, hook bolts, or clips and are available in lengths up to 12ft.

Asbestos Cement Sheets

Asbestos cement sheets are manufactured from cement mortar reinforced with asbestos fibre and are available with small, large, or angular corrugations. Standards are laid down for manufacture which specify dimensions, breaking loads, water absorption, acid solubility, etc., all of which are covered by inspection and test.

All auxiliary equipment such as ridging, ventilators, guttering, and down-pipes is available in the same material.

The sheets are fastened with galvanised screws or bolts having flat under sides to the heads under which washers with a coating of bitumastic material are used to make the fastenings water-tight. Holes for the screws or bolts must be drilled and not punched.

Plastic Corrugated Sheet

Plastic corrugated sheet is of standard size and corrugations and is a laminate composed of resin-impregnated wood fibres bonded together under great pressure and regulated temperature to give a very dense, homogeneous, and tough material.

It is fireproof and, as far as tests can ascertain, permanent. Its heat transmission is low in comparison with metallic sheetings and it has a high strength value while still retaining lightness. Acid fumes have no effect on this material; direct contact with acid solutions causes only slight staining and for all practical purposes it is unaffected by acids or caustic soda, which makes it suitable for fertiliser sheds.

Asphalt-saturated Fabric

Asphalt-saturated fabric is usually termed roll roofing, as it is supplied in rolls 3ft. wide. It is a rag felt saturated with asphalt or bitumen and then coated with bitumen. It can be obtained in various weights usually termed ply, though this term has no relation to its construction, as the material is not a laminate.

Asphalt-saturated fabric is a very inexpensive and convenient form of roofing material, as it can be laid in horizontal lengths from the eaves to the ridge with the lengths lapping over each other. If all sharp angles are avoided on the ridge and additional layers provided, it requires no special ridging. It is fixed by use of galvanised clouts staggered along the laps, the upper lap being sealed with either hot bitumen or bitumen adhesive.

As it is virtually a very thin layer of reinforced asphalt, this roofing is not permanent and is more suitable for sheds or buildings where a leak may not be detrimental than for dwellings. The same material, however, when used in conjunction with other materials to produce a thick layer of reinforced asphalt becomes a permanent roofing.

Mineral-surfaced fabric is the same as the other fabrics described but with a mineral incorporated in the outer bitumen coating to give colour.

Tiles

Tiles in some form or another have been in use as a roofing material for several centuries. Tiles of several patterns may be obtained in glazed or unglazed baked clay or in coloured or plain concrete. All patterns have tongues and grooves to ensure angled mating surfaces at side and end overlaps. The tiles are laid in rows on battens, the higher rows overlapping the lower rows and each tile overlapping its neighbour on one side. They are usually fixed by wiring to the battens and the top and bottom overlaps may be cemented with a lime mortar to assist in waterproofing.

As tiles absorb moisture, they must be laid with sufficient slope to shed rain quickly. Special ridging of the same material as the tiles is usually provided to suit each type. This is usually of the half-round type with female spigot, the spigots and joints to the roof being filled with cement mortar. Half tiles at the ends of gables are usually fixed by drilling to accommodate galvanised screws.

Plain Asphalt

Plain asphalt roofing forms a good permanent protection and consists of an asphalt-base hot mix applied in two ½in. layers to give a 1in. thick coating of asphalt over the whole roof area. This method is particularly suited to relatively flat roofs, where creep cannot be accentuated by slope. The layers of asphalt are placed hot over impregnated paper or felt laid on the roof deck and are screeded off, the upper coat being smoothed off with a float in a manner similar to that for finishing concrete.

Built-up Asphalt

Built-up asphalt roofing consists of alternate layers of felt and asphalt. Different types or weights of felts may be used for alternate layers, the lower layer being firmly attached to the deck by clouting, with the succeeding layers pressed into the coatings of hot asphalt. By use of perforated felts for the top layers air trapping under the felt is avoided, the hot asphalt on which the felt is laid squeezing through the perforations with resultant better bonding.

These roofs may be finished with a gravel coating, a mineral-surfaced cap sheet, or a bituminous paint, preferably aluminium or silver.

Factors Affecting Cost of Roofing

The cost of a roof cannot be assessed by the cost of the material. Several factors affecting the cost must be considered as spread over a period of reasonable life expectancy for the roof. They are cost of materials, cost of labour, type of structure required to support protecting fabric, subsequent maintenance, and economic life. These factors are all inter-related; for example, some materials incur no main-

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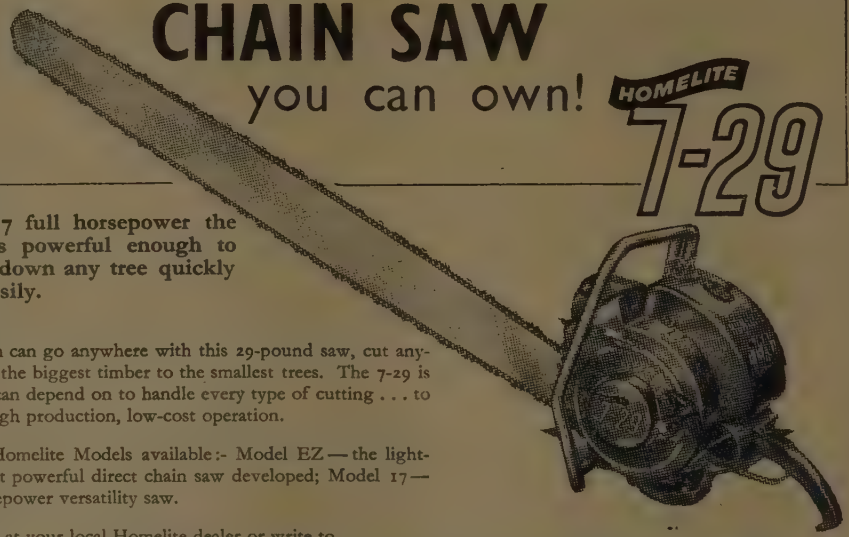

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THE JOURNAL OF THE BRITISH GRASSLAND SOCIETY

Editor: A. G. G. Hill.

This Journal is a medium for the publication of the results of research and practical experience in the realm of Grassland Husbandry.

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TABLE 1—COVERAGE OF ROOFING MATERIALS

Material	Width	Effective width allowing for overlap	End lap	Length of sheets
	in.	in.		
Corrugated iron	27	21		6ft. to 10ft. by multiples of 1ft.
Corrugated Aluminium ..	32	28		4ft. 6in. to 12ft. by multiples of 3in.
	24	22½		
Treated steel				
Small corrugations ..	27½	23½		5ft. to 11ft. by multiples of 6in.
Large corrugations ..	26¾	23½ 1 corrugation lap	Dependent on pitch of roof; 6in. minimum in most cases	
V beam	24¼	20½ 1 corrugation lap		
Corrugated asbestos				
Large section	41⅓	35⅔		4ft. to 10ft. by multiples of 6in.
	43	37¼		
	38	32		
	36⅓	29½		
Small section	29⅓	26⅓		4ft. to 10ft. by multiples of 6in.
	30	27		
	42	39		
	31⅓	28⅓		
Tiles	Average of 120 tiles per 100 sq. ft.			

tenance costs for the full period of their economic life; others give substantial economic life if well maintained, but deteriorate rapidly without maintenance. Deterioration of some materials cannot be prevented even by maintenance, and their economic life is shorter.

The type of structure required to support the protecting fabric is important in that though some materials are heavy and require a relatively strong structure, other materials are light and strength of structure can be reduced accordingly. Again some materials require no "deck" and no under sealing as a protection against condensation, which also effects a reduction in the cost of supporting structure. Table 1 gives the lengths of sheets of different roofing materials and the area they cover.

The type and purpose of the building will also influence any decision as to material; for example, though roll roofing may be suitable for an implement shed, something more durable is required for a dwelling.

Table 2 shows the characteristics of various roofing materials. The figures given in column 2 are approximations, as these costs can be affected by various factors; for example, the combination of lengths of sheet of corrugated iron or aluminium will affect the cost. Similarly the design of roof, placing of ridges and valleys, etc., can affect cost of both material and labour.

Though all roofs require rafters and some materials require sarking, others require purlins only. The relative cost difference between purlins and close sarking is represented by a figure of 9.2, which can be added to the materials requiring sarking to bring them on to a comparative basis with material requiring no sarking. For example, item 4 in the table requires no sarking, whereas item 2 does; therefore 9.2 is to be added to item 2 (14.1 + 9.2 = 23.9). A comparison of the two sets of figures shows that a roof in treated steel will cost approximately half as much again as a roof of the same size in corrugated aluminium. As tiles need no sarking, a tiled roof costs only slightly more than aluminium, though more timber is needed in the supporting structure to give greater slope.

As the cost of roofing is a capital charge which must be spread over the reasonable life expectancy of the building, choice of material should be influenced by maintenance costs. The following example illustrates this.

From the table two materials are chosen, the initial cost of one being more than half as much again as that of the other, and their cost over a period of 30 years is compared.

	Corrugated iron	Treated steel
Area of roof	1000 sq. ft.	1000 sq. ft.
Type of roof	Pitched	Pitched
Initial cost ..	£100	£156
Maintenance	Painting 2 coats at 5-yearly periods at £25 per time for 30 years = £150	Nil
Cost after 30 years ..	£250	£156

This example shows that the initially more expensive roof is in the long run the cheapest by a wide margin, particularly as after 30 years the corrugated iron roof would probably require extensive repairs, whereas the treated steel roof should be as satisfactory as when it was first erected.

Reference

D.P.L. Information Circular No. 1187.

TABLE 2—CHARACTERISTICS OF ROOFING MATERIALS

Type of material	Comparative cost index of laid materials	Type of roof	Structure to support	Under sealing	Maintenance	Approximate life
1. Corrugated iron ..	14.1	Pitched	Purlins or close or open sarking	Requires water-proof underlay	Regular painting	30 years or more, depending on maintenance
2. Corrugated aluminium ..	14.7	Pitched	Close or open sarking	Requires water-proof underlay	Painting for aesthetic reasons only	Indefinitely permanent
3. Aluminium strip	25.9	Pitched or flat	Close sarking	Requires water-proof underlay	Painting for aesthetic reasons only	Indefinitely permanent
4. Treated steel ..	37.8	Pitched	Purlins only	Not required	Not required	Indefinitely permanent
5. Corrugated asbestos cement						
Large	16.5	Pitched	Open sarking	Optional	Not required	Indefinitely permanent
Small	15.3	Pitched				
6. Plastic corrugated sheets	48.0	Pitched	Purlins or open sarking	Optional	Painting for aesthetic reasons only	Indefinitely permanent
7. Fabric roofing, 1 layer only ..	2.5	Pitched	Close sarking	Not required	Regular dressing	Temporary only
8. Tiles						
Clay	27.0	Pitched	Close spaced battens	Not required	Not required	Indefinitely permanent
Concrete	25.8	Pitched				
9. Asphalt roofing ..	53.0	Flat	Close sarking	Forms part of roofing	Occasional dressing may be required	Indefinitely permanent
10. Asphalt and fabric (standard) ..	26.6	Flat	Close sarking	Forms part of roofing	Occasional dressing may be required	Indefinitely permanent

Farm Ponds to Increase Wild Duck

Views of Pond No. 1 taken in 1955 (upper) and 1956 (lower).

THERE is increasing interest by farmers in producing wild ducks both for sport and aesthetic reasons. Reports from overseas show that wise farm management and game production are both possible on an efficient unit. This article by L. C. Bell, Field Supervisor, Wildlife Branch, Department of Internal Affairs, Wellington, discusses the results achieved by a Northland farmer, Mr. C. W. Kokich, of Kokopu, who is a pioneer of this movement in New Zealand.

THE valley of the Mangere Stream west of Whangarei is typical Northland farming country, with fertile flats bounded by poor hills. There are extensive swamps to the north and smaller ones to the south, with the tidal reaches of Whangarei Harbour to the south-east. The Kokopu district has thus been noted for grey duck, but in recent years much of the swamp lands have been developed for farming.

Mr. Kokich's farm at Kokopu is of 400 acres. It was originally developed by his father, but the present owner has increased its production until today the larger part of the property is highly developed. Numerous shelter belts planted round the paddocks are a feature of the farm. A herd of 140 to 150 cows is milked and replacements for these are bred and carried on the property together with store cattle, a total of about 230 head of stock being carried yearly.

Mr. Kokich with an assistant manages the herd, calves, store cattle, and pigs. From 2000 to 3000 bales of hay are produced each season, while usually each season from 200 to 350 tons of lime and fertilisers are spread by contractors.

As he developed the farm Mr. Kokich decided that he would like to have a place where he could see wild ducks and shoot a few during the shooting season. Mr. Kokich believes that responsibility for maintaining duck numbers rests with the shooting land-owners, acclimatisation societies, and shooters and that they must now realise that the days are about ended when any old thing will do for wildlife. The longer conservation measures are withheld the harder it will be to arrest the decline in the grey duck population.

Mr. Kokich urges landowners to provide habitat conditions under which duck will increase. He states that the measures taken on his farm, details of which follow, have produced more than 1200 ducks in 10 years. Shooting has been restricted to an average of 17 ducks per gun each season for two guns.

Siting of Dams

Mr. Kokich had little choice in selecting dam sites, but fortunately on the property there was a shallow gully running through a gently undulating alluvial flat close to the Mangere Stream which provided sites for the first three dams. The drainage area was limited and normally the stream does not carry a big volume of water, thus lessening the risk of wash-out through lack of balance between dam strength, size of spillway, and maximum water flow. The gradual slopes of the land ensured that the floor profile for each pond shelved gradually. This resulted in shallow ponds—a very important feature.

The fourth dam site was 500yds. away in rolling hills on the fringe of some scrub-covered, undeveloped gumland. In this less suitable terrain water depth is greater, except at the head of the pond.

Pond No. 1

Initially the site of Pond No. 1 was a small, manuka-covered swamp with no open water situated in a corner of the farm. Most of the scrub was first cleared by hand to ultimate water level, but a certain amount was left standing out of the water to provide escape cover for the ducks from hawks. A small amount of raupo was also left for the same purpose. Using horses and a scoop Mr. Kokich in 1947 built an earth dam 60ft. long and 5ft. high, with a width of 25ft. at the bottom tapering to 15ft. at the top. This backed up ¾ acre of water of which most was less than 3ft. deep.

Before the dam was closed a spillway was excavated on solid ground around the dam. Finally the dam was sown in grass and afterward top-

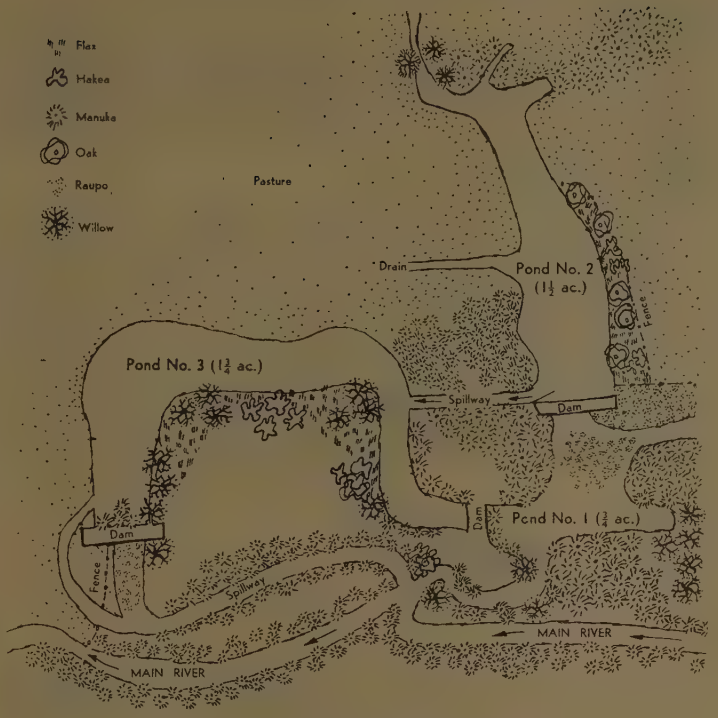
dressed three times, with a view to obtaining the best possible sole of grass for consolidation as soon as possible. This practice was followed in later ponds, and the dams now serve as useful tractor crossings. Natural plant cover on the banks of the pond was left. This was predominantly manuka with a few small totara and some undergrowth.

The pond, dam, and a fringing area were then made stock proof by some fencing which was additional to the existing boundary fences. As there were gaps in the natural growth, weeping willow, flax, oak trees, and *Hakea saligna* were planted in carefully selected areas.

The cover plants put in have made rapid growth, owing to fertile soil and high rainfall. Without any planting many kinds of aquatic plants have become established, including types completely submerged, those partially submerged, and ones which grow on banks at the water's edge. Among these are a number of plants which provide ducks with food.

Grey ducks began using this pond immediately. It was shot over during that year's shooting season and a limit bag was obtained on the first day. With the coming of spring five clutches of grey duck were reared and further clutches have been reared each year since.

A valuable shallow feeding margin on Pond No. 1 with duck tracks through the vegetation.



Plan of Ponds No. 1, No. 2, and No. 3.

Pond No. 2

The dam for Pond No. 2 was constructed by a bulldozer contractor in 1949 at the very head of the first pond. This earth dam is 12ft. high and 150ft. long, being 30ft. thick at the bottom and tapering to 12ft. at the top. The earth was obtained from the excavation for the spillway leading to Pond No. 3, which was cut 6ft. deep and 10ft. wide at the bottom with sloping sides. The spoil was pushed directly into the swamp forming the dam and involved 25 hours' bulldozing at £3 per hour. Present costs are much the same. An area of 1½ acres of water was thus obtained with a considerable amount of shallow water under 3ft. deep along the edges and at the head.

After excessive rainfall during a cloudburst in 1953 the dam gave way. It was rebuilt the following year with a much larger spillway cut on the solid through clay, and Mr. Kokich is confident that it is now large enough to cope with such downpours. Ducks began using the pond as soon as it was full. As well as grey duck it was pleasing that the rare brown duck (commonly called brown or red teal) found it to their liking, and as many as 30 have been counted there at one time.

During the first years, cover was provided by several clumps of native trees and shrubs already growing about the pond. In 1955 improvements were made by fencing along part of one side of the pond and planting the types of plants already mentioned in the resultant enclosures. The banks of the pond on the other side are mostly in pasture and as they gradually shelve, they provide good sunny loafing spots for ducks as well as allowing stock to get to water.

Pond No. 3

Pond No. 3 was constructed by bulldozer at the same time as No. 2, the site being chosen so that its headwaters reached to the base of the dam of Pond No. 1. An earth filling 7ft. high, 90ft. long, and 22ft. wide at the bottom and 12ft. wide at the top holds back 1¾ acres of water, of which most is less than 3ft. deep. A short length of fence was erected to exclude cattle on one side of the pond, and the enclosed area planted with the same species as already mentioned. On the

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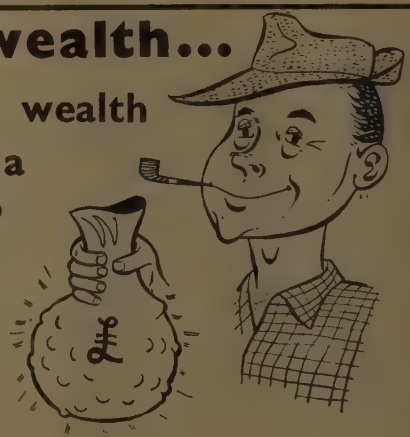

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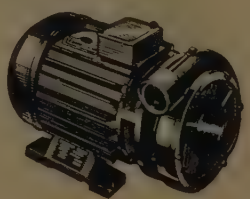

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other side of the pond there is ample opportunity for duck loafing spots and stock watering.

Pond No. 4

Pond No. 4 is in a back corner of the farm not yet developed from scrub. The scrub area is fenced off from the remainder of the farm and water for stock is piped from the dam through the fence to the adjacent paddock. Later, when the area is developed it is planned to retain a small area of scrub about the pond and ring fence it, still piping out water for stock as at present.

This pond was also constructed in 1949, and the 15ft. high dam banks up ½ acre of water, of which much is 10ft. or more deep. Shallows are mainly restricted to the head. As the ground here is less fertile than on the flats, there is not such a lush growth of aquatic plants along either the edge or in the restricted shallows.

▲ Pond No. 2, showing flax planted on the margin and drowned scrub in the water (upper left).

▼ A corner of Pond No. 2, showing good cover and gently sloping sides, with a mud bank and log providing loafing places.

Cover

Wherever possible existing plant growth has been used to give cover for nesting, brooding, and general shelter and to provide escape cover from hawks for young birds. Where necessary trees were planted to a planned pattern—weeping willows just in from the water's edge at intervals to provide shade, brood cover, and escape cover, hakea behind and between the willows to reduce winds and draughts, and scattered oaks for general shelter, as acorns are a useful supplementary food for ducks. Clumps and rows of flax have been put in at the back of the trees to supplement nesting cover.

Weeping willows provide good cover and, unlike many other kinds of willow, do not spread aggressively over wet lands. However, because they can overshadow much of a pond and reduce the amount of sunlight, which limits aquatic plant growth, some of them may have to be cut out when they become large.

It is known from experience elsewhere that blankets of duck weed (*Lemna* and/or *Spirodela*) can cover water in ponds if they become too sheltered. Such close growth can cut off light from other aquatic plants and so some thinning of the shelter belts may be required. In suitable waters raupo can also become aggressive, ousting useful aquatic plants and eventually leading to a pond silting up. This problem could be dealt with by controlled raising of water levels to drown out the raupo.

Loafing Places

Though cover is essential, Mr. Kokich realises that a dense jungle of vegetation right to the water's edge and completely surrounding a pond is not desirable. Ducks like to be able to get on land at a gently shelving margin and sun themselves, preen their feathers, and sleep. Such a margin is not as important on an area used only at night for feeding, but is essential in daytime resting areas and adjacent to nesting cover.

Where cattle have free access to a pond they may, by trampling and eating, reduce the marginal vegetation to a point where few food and cover plants are left and the area is no longer attractive to waterfowl. A happy medium has been achieved on this farm by having part of the margin fenced and part available to stock. A portion of the margin thus provides food and cover and the remainder the open shore line which is equally important for waterfowl.

Food Plants

Aquatic plants readily established themselves on Pond No. 1 and in shallow waters in other ponds. Where stock were debarred from free access marginal plants soon grew up. Not a great deal is yet known about duck foods in New Zealand, but from work overseas and the little known here there is among aquatic and marginal plants a variety of food. Oak trees provide acorns, which are available for only a portion of the year, but ducks can and do range far and wide to obtain suitable foods during the various seasons of the year. Even the young can be, and are, moved by the

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1 . . . *dog eats infected raw offal . . .*

cut cycle here by boiling all offal

you feed your dogs. Otherwise bury it. Dispose of stray carcasses around the farm. If your dog is allowed to eat the raw offal of farm animals, he develops, in seven weeks, hydatid worms which produce 500-600 eggs every few days. Dogs' excreta exposes the eggs . . . and so infection continues . . . to farm, animals, and human beings.

2 . . . *dog expels hydatid eggs . . .*

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every three months with Arecoline. This will kill the worms. The purge must be burned, buried or disinfected because the eggs are only expelled, not killed by the drug. Animals and humans absorb hydatid eggs.

PRECAUTIONS FOR FARM FAMILIES

Wash thoroughly all fruit and vegetables eaten raw. ● After handling animals, never put hand to mouth without washing. ● Be sure children wash hands before eating.

Remember hydatid infection usually starts in childhood.

Your co-operation on hydatid control is urgently needed.

mothers to where food is available. However, from the number of young birds reared on the farm it is evident that food of the right kinds for young birds is available on and about the ponds.

Seeds of many plants are carried on the feet and feathers of ducks, so that conscious effort to establish a suitable range of aquatic plants is not necessary. Until the food plants which grow or can be grown on or near the margins of ponds are identified there is little point in planting for food.

A farmer should be exceedingly careful if he decides to introduce a plant for food. If he has any doubt about the value or growth habit of the species, he should seek the opinion of a field officer of the Wildlife Branch or of the Department of Agriculture. To introduce unwittingly a serious weed, such as water hyacinth, could be disastrous.

Predators

Unlike many sportsmen and farmers, Mr. Kokich has made no special effort to control predators. He has relied on the provision of suitable conditions for ducks to thrive. Investigations he has made showed that even pukeko, regarded by so many as a menace to ducks, did not adversely affect production of grey ducks on his farm. From the study of some 30 nests Mr. Kokich found that the rat, not the pukeko, was the main predator.

Pond No. 3. Upper—Fenced-off, ➔ planted area on left of pond and open, grassy bank on right. Lower—Corner of pond with bare shoreline at low water, a good loafing spot for ducks.

Pond No. 4. Forty-six ducks were leaving the water as the photograph was being taken. On the far side is a belt of manuka that has been flooded.

Conclusion

An indication has been given of the production of grey ducks which has been obtained by suitable management of a few acres of farm land for waterfowl. Much money and effort have been spent throughout New Zealand on the establishment and attempted establishment of mallard ducks. However on this property, and it applies to a few others known, the owner has shown that native ducks can be increased if suitable attention is given to their requirements and that good farm management and wildlife production can work together.

To Mr. Kokich the aesthetic value far outweighs the money spent, but from the strictly practical viewpoint he has been rewarded in his good land management by the establishment of stable ponding areas which provide not only clean, cool water for stock, but assist in preventing soil erosion. The dams also provide useful points at which a tractor can cross a gully. Last, but not least, he is able to harvest a portion of the duck crop which his land produces.

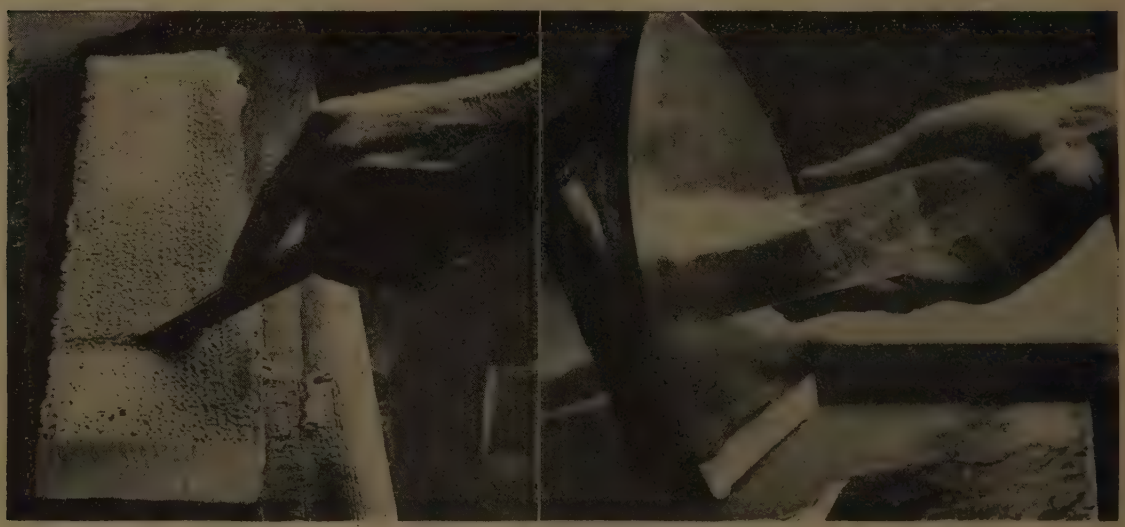
Preparation of Cut-comb Honey for Market

By E. SMAELLIE,
Apiary Instructor, Department of Agriculture, Auckland

COMB honey is produced and sold on the local and export markets as section comb honey and cut-comb honey. Though section comb honey and the comb used for cut-comb honey are sold in the form in which they come from the hive, cut-comb honey has its own identity as a product and requires different management to prepare it for market. The production of section comb honey was discussed in a recent series of articles in the "Journal", and in this article the author describes the preparation for market of cut-comb honey.

CUT-COMB honey is produced in shallow supers much the same as honey is produced for extracting. Instead of wired frames and the usual heavy foundation, only sheets of thin super foundation are used in the shallow frames. The finished combs are too fragile to extract, being equally as delicate as section comb honey. At this stage the only difference between section comb honey and that to be used for cut-comb honey is in the size

The frame being lifted away from the cut edges of the comb. The scales are required to weigh each piece of cut comb before it is wrapped in transparent cellulose and heat sealed.



Left—An 8oz. piece of comb being cut off the big comb with a thin-bladed knife. A fruit paring knife is ideal for this. Right—The folded ends of the wrapper being heat sealed with a thermostatically controlled electric iron.

of the combs. The latter is cut into pieces and wrapped in transparent cellulose and is called cut-comb honey.

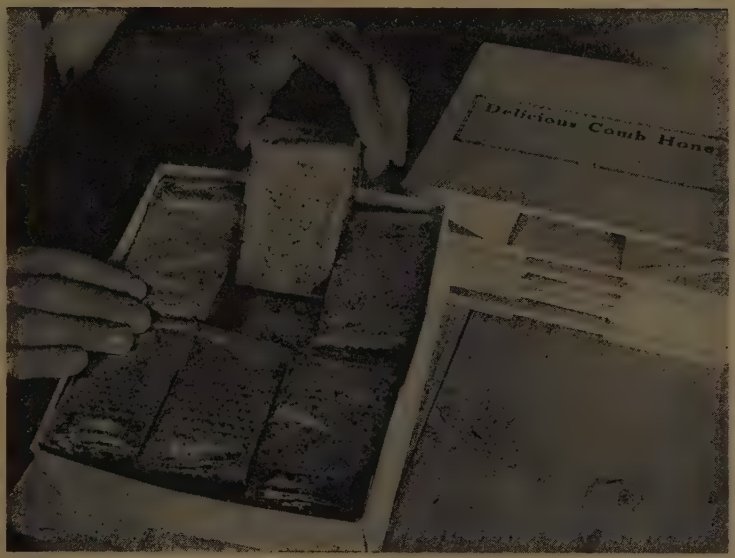
Cutting the Comb

Various methods are used for cutting the honey from the shallow frames. In Auckland areas where manuka honey is produced for the cut-comb market the usual procedure is comparatively simple. Each full comb of honey is taken from its super and placed flat on a metal-covered table after the burr comb has been removed from the top and bottom bars of the frame. A knife cut is made first along the length of the top bar of the frame about ¼in. from the wood, then along the bottom bar, and finally at each of the end bars. The frame is lifted away from the comb and after the adhering honey and beeswax have been scraped from the frame into a suitable container the empty frame is replaced in its super. The full comb is then cut into smaller pieces of about 8oz. each; the minimum net weight allowed is 7½oz.

Wrapping and Packing

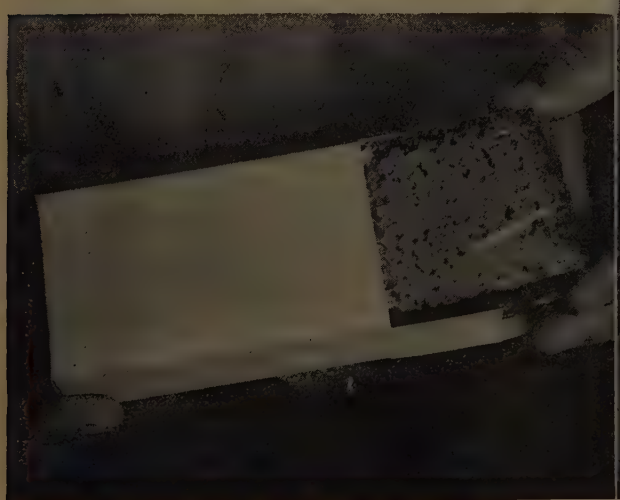
Owing to the thixotropic (very viscous) nature of manuka honey, it is not necessary to drain the cut edges; therefore, each piece of cut comb can

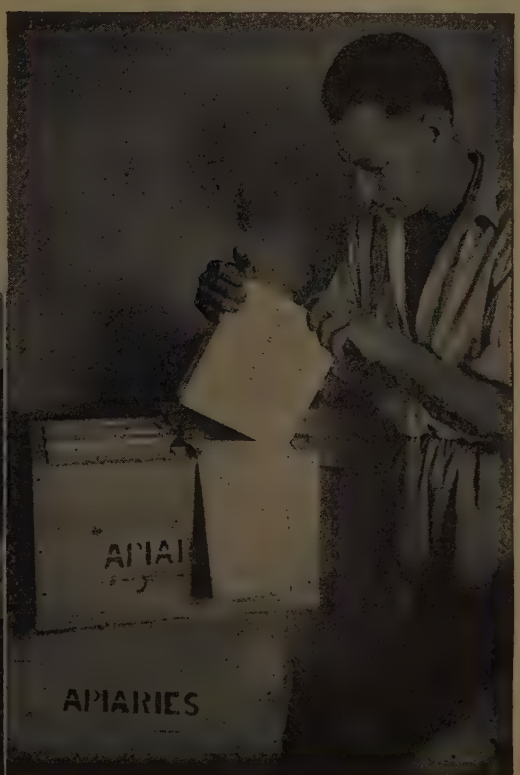
PREPARING CUT-COMB HONEY FOR MARKET



For distribution to retailers and for shop display 1 dozen 8oz. pieces of cut comb are packed in a labelled carton.

Below and at right—Packing cut-comb honey for export. Below—Each wrapped piece of cut comb is packed in a small carton and then 12 of these cartons are packed in large cartons such as that shown being put into the box at right. The strip of paper is placed over the box before the last carton is put in. When the carton is pressed into the case the strip of paper fits right round the carton, and its ends later provide hand grips which facilitate unpacking of the case without damage to the honey combs.





be wrapped as soon as it has been cut and check weighed. Each piece is wrapped in two layers of moisture-proof, heat-sealing transparent cellulose wrapping, and the ends of the package are heat sealed by pressing the folds against the sole of a moderately heated household iron.

For distribution to local retailers and for shop display 12 of these wrapped pieces of comb are packed into a labelled carton. For the export trade, however, it is necessary to pack each piece of cut comb in a small printed carton. Twelve of these small cartons are then packed into a larger carton.

When these larger cartons are required for export ten cartons are packed into a shipping case. A strip of stiff paper placed across the width of the case above the space for the last carton provides a handy grip for the removal of the cartons when they are being unpacked. This facilitates unpacking and prevents damage to the comb honey. The shipping case when packed contains 120 pieces of cut comb, giving a net weight of about 60lb. and an over-all gross weight of about 80lb. The bottom of the shipping case is lined with 1in. of wood-wool, over which is placed a sheet of corrugated cardboard. No other wood-wool is used, but on the sides, ends, and tops of the cases a sheet of cardboard is placed so that the cartons are surrounded with cardboard. The shipping cases are made of ⅞in. dressed timber with outside dimensions of 18in. x 11in. and are steel strapped.

As with section combs cut-comb honey must conform to a high specification for grading before it can be passed for export. The specifications are in most respects similar to those for section comb honey.

All photographs by Sparrow.

"Pasture Production in New Zealand"

"NEW ZEALAND'S grassland covers about 31,000,000 acres and feeds about 38,000,000 sheep and 5,750,000 cattle. These in turn convert the produce of this grassland into about 225,000 tons of butterfat, 195,000 tons of wool, and 600,000 tons of meat each year.

This opening paragraph of the latest edition of "Pasture Production in New Zealand", Bulletin No. 250 of the Department of Agriculture, introduces a comprehensive discussion of the most important factor in New Zealand's economy, pasture production.

The bulletin's value is enhanced by a great number of illustrations. It can be obtained from main offices of the Department of Agriculture for 2s. 6d. a copy.

Air Layering of Peach Trees

By J. C. GERLACH,
Tropical Agronomist, Department of Agriculture Rukuhia Soil Research Station

AIR layering is a method of propagating plants to obtain progeny true to variety. The method, also known as Chinese layering, and in Europe as marcotting, is more often used on ornamental trees and shrubs. At Hamilton recently it was tried on two varieties of peach trees, a Golden Queen and a Le Vainqueur.

AIR layering consists of ringbarking or wounding a branch of a tree and enclosing the wounded part with soil, sphagnum moss, or some other moisture-retaining medium, the whole being wrapped in a bag of fibre bundles (coconut fibre or *Phormium*) or plastic. The method produces a plant true to variety, more so even than grafted or budded plants, where the scion may be influenced by the rootstock. It is preferable to use young branches up to 1in. thick, as these grow on more readily than larger branches and the balance between the newly formed roots and the branches is regained more rapidly.

Spring Layering Better than Autumn

The Golden Queen was air layered in spring and this gave better results than were obtained with the Le Vainqueur, which was treated in summer.

To preserve the well-developed main frame of the Golden Queen tree a minor fruiting branch about ½in. thick was ringbarked over a band 1½in. wide, care being taken not to cut into the wood. To ensure quick rooting a root stimulating hormone (B-naphthoxy acetic acid 1 per cent. in talcum powder base) was applied at the upper edge of the debarked part. A bundle of coconut fibres was then tied on the branch below the wound (see illustration at left in diagram) and folded back to form a bag to hold the rooting medium.

The fibre bag was filled with ordinary dark, loose garden soil from beneath the tree and tied firmly over the top of the debarked area (see illustration at right in diagram).

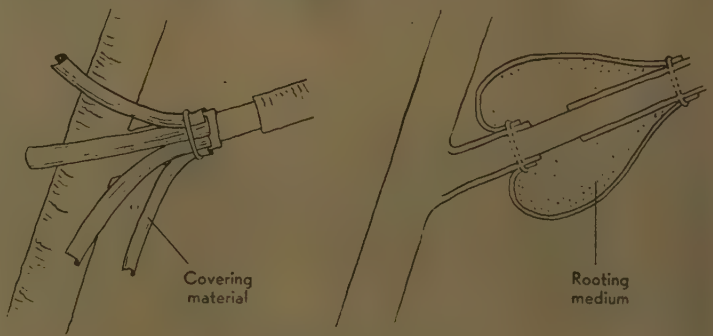
The Golden Queen peach tree developed from air layering and planted out in a pot. It has been pruned and has had some of the leaves removed.

The rooting medium was kept moist during the whole process of root forming, as this is essential.

When numerous roots were showing through slits in the coconut fibre the plant was sawn off the tree below the bag and was planted in a pot with the fibre bag still in position. (If a plastic bag is used, the bag must be removed carefully to avoid damaging the roots.) Later the plant was pruned and part of the leaves removed to reduce evaporation and regain the balance between roots and crown.

The Le Vainqueur tree received the same treatment.

The pots containing both plants were plunged to their rims in soil in the open, and the plants were set out in open ground the following spring.



Method of air layering.

Seed Production in New Zealand

Timothy .

By W. L. HARBORD,
Fields Instructor, Department of Agriculture Flock House Farm of Instruction, Bulls

TIMOTHY seed has been included in pasture mixtures in New Zealand practically since the first pasture plant seeds were imported into the country. Known botanically as *Phleum pratense*, timothy is used as a pasture grass in most countries with temperate climates and is a valuable plant in pastures on rich, moist soils throughout New Zealand. It is so palatable to stock that it is frequently grazed so hard that the farmer believes it has disappeared from his pasture. The plant is tufted in habit and the stems are usually swollen at the bases. The flower head is long when grown under good conditions and somewhat resembles that of meadow foxtail, though that of foxtail ripens much earlier. Timothy is a hardy plant, resistant to frost damage. Though best suited to moist soils, it does not thrive well under permanently waterlogged conditions.

STATISTICS of New Zealand production of timothy seed are available only from 1946. It is reasonable to assume that the annual acreage harvested before that year was not great, and that farmers depended very largely on overseas sources for their seed. More than 90 per cent. of the imported seed has come from the United States of America, which seed could be landed in the Dominion at a cost appreciably less than that for which New Zealand growers were prepared to produce it.

Timothy seed has been produced continually on some Southland farms since 1890, and one paddock after 27 consecutive harvests returned an average yield of 240lb. per acre.

Improvement of Strains

During the Second World War imports were curtailed somewhat, and as a result some impetus was given to Dominion production. That has been accentuated by the introduction of improved strains of timothy, and now sufficient seed is being saved to meet most New Zealand requirements.

Trials have shown that seed imported in the past generally was of a poor type, particularly in comparison with the strains developed by the Aberystwyth Plant Breeding Station in Britain. Seed of natural New Zealand origin has shown some variation in type, the worst being no better than imported and the best still inferior to the Aberystwyth strains.

A line of S.48 timothy seed imported by Canterbury Agricultural College from Aberystwyth in 1939 formed the nucleus for improved timothy strains in New Zealand, and the work of selection has been continued at Palmerston North by the Grasslands Division of the Department of Scientific and Industrial Research. As a result a locally raised pedigree strain has been released for multiplication under commercial conditions.

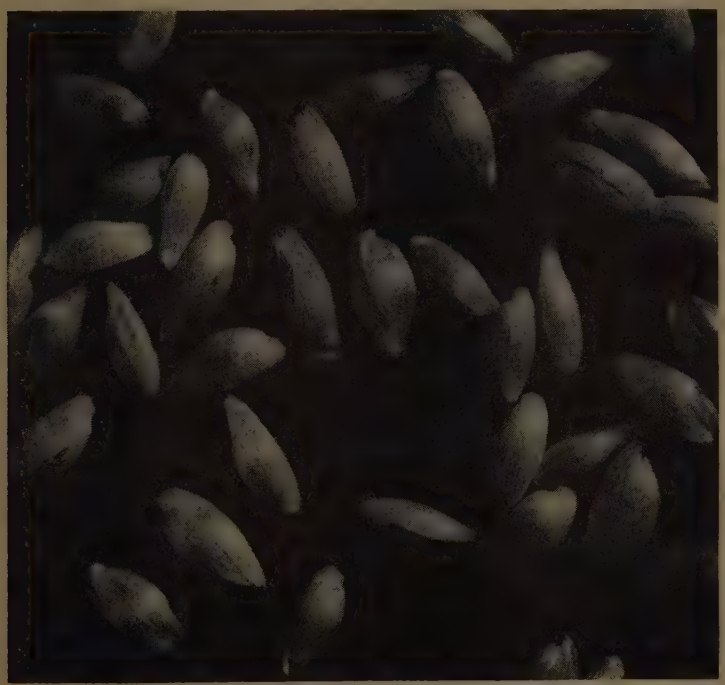
Certification of timothy seed, based on material produced from the introduction made by Canterbury Agricultural College, was begun in 1945, and the release of the pedigree strain has enabled the establishment of the following four classes of Certified seed:—

Government Stock seed: Grown under contract by the Department of Agriculture from nucleus selected material supplied by the Grasslands Division.

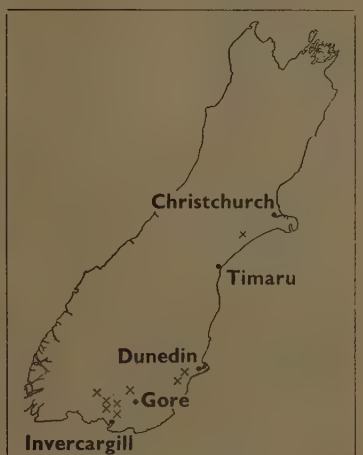
Pedigree seed: The produce of areas sown with Certified Government Stock seed.

Mother seed: The produce of areas sown with Certified Pedigree seed.

Standard seed: The produce of areas sown with Certified Mother seed.



Timothy seed (about 7 times natural size).



Practically all the timothy seed harvested in New Zealand is produced in the South Island. The crosses indicate the principal seed-producing areas.

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TIMOTHY SEED PRODUCTION

Timothy shut up for seed production, with a bottom growth of white clover coming into flower.

Cultivation and Sowing

The soil type most desirable for timothy seed production is a rich, deep loam with a clay subsoil adequately drained. Timothy for seed can be sown at almost any place in a rotation of crops, but it is usual to sow the crop after swedes or turnips have been eaten off by sheep or cattle.

Cultivation before sowing usually starts as soon as the swedes or turnips have been eaten off. A first discing is followed by periodic discings and harrowings until November, when the ground is rolled heavily 2 or 3 times to form as firm a seed-bed as possible. Good consolidation is essential for a good strike of this crop.

Though the broadcast method of sowing seemed satisfactory in past years, best results are obtained when the seed is sown in 7in. drills at about 3lb. to 5lb. per acre, compared with as much as 20lb. per acre by former methods. A cover crop of rape is usually sown, 1½lb. per acre usually proving ample.

White clover is sometimes included with timothy in a seeds mixture when the paddock is sown, the general idea being that the white clover acts as a source of nitrogen for the timothy, and helps to maintain high soil fertility.

When the timothy is harvested and threshed white clover seed is also threshed out and becomes an impurity in the timothy seed which is extremely difficult to remove completely.

There appears to be little or no justification for sowing white clover with timothy when the paddock is intended primarily for seed production, because the smothering effect of the timothy, particularly if the area is not grazed, suppresses the white clover in a season or two. Red clover has also been sown with timothy for the same reason, but the timothy also tends to smother this clover in a short time.

To produce its best, timothy requires land of naturally high fertility, and with this condition applications of nitrogenous fertiliser appear to be unnecessary for seed production. In Southland paddocks of timothy have been harvested for seed every season for many consecutive years without the use of nitrogenous fertiliser. For example, the average yield from a paddock from which 38 consecutive harvests were taken and on which no artificial fertiliser or lime was applied during the period was 2½ sacks of dressed seed per acre.

Where timothy is being grown on light land an application of nitrogenous fertiliser may be expected to give a payable increase in seed yield under normal conditions; it is advisable, however, that the quantity applied per acre should be about 1cwt., as heavier applications tend to produce soft straw and heavy leaf growth with a consequent tendency to lodge.

On high-fertility land used for growing timothy seed areas may be grazed by either sheep or cattle without the stand being weakened. In some instances timothy paddocks have been used as "run-off paddocks" for sheep grazing on turnips during winter. Grazing should not be carried on too late, generally not later than the end of September, as late grazing followed by dry weather results in the ground caking with resultant poor growth of timothy.

The crop responds well to liming, and it is as well to apply 1 ton of carbonate of lime per acre before the sowing of the swede crop and another 1 ton during the cultivation preparatory to the sowing of the timothy seed. One bag of superphosphate per acre is applied when the seed is sown, and the crop is topdressed annually with a bag of superphosphate and 5cwt. of carbonate of lime.

When the seed is sown during November the crop is grazed as soon as the cover crop of rape is ready, which is about mid-February. It is grazed by weaned lambs until not later than the end of April, after which it is best not grazed during its first winter, but many farmers use the paddock to provide greenfeed for pregnant ewes from about mid-August to combat antepartum paralysis. Grazing may then be carried on with ewes and lambs until the area is closed for seed production by mid-October, when the annual topdressing of superphosphate and lime should be applied.

Under Southland conditions an area closed to stock by mid-October and topdressed immediately will usually be ready for harvest by about mid-March.

Harvesting

To determine when the crop is ready for cutting is simple, as it can be cut as soon as most of the heads are in such a condition that the seed head

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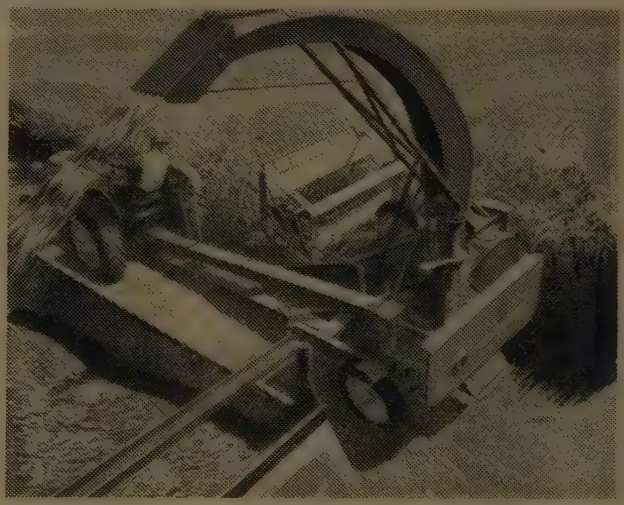

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can be stripped from the stalk when the thumb and forefinger are run up the stalk. If the seed head will not come away, leaving a bare stalk, the crop is not ready for cutting. The crop is usually ripe when the seed has disappeared from the tip of the seed head.

As with most other seed crops the trend in the harvesting of timothy seed is to use the binder in conjunction with the header harvester. When the crop is ready it is cut with the binder, a fairly long stubble being left and the cut material being run through untied, so that it forms a windrow. If the crop is heavy, it is an advantage to use a 6ft. rather than an 8ft. binder, as there is less bulk in the windrow, which consequently dries out more rapidly.

The cut material should be left undisturbed in the windrow until it is thoroughly dry; this will take anything from 10 days to 3 weeks or even longer according to the weather. When thoroughly dry the windrows are picked up and threshed with the header harvester; care is necessary to ensure that this is done at the correct time. It is also necessary that a careful watch be kept on the setting of the concaves, as too close setting and hard driving will result in a large proportion of shelled seed.

In the past the method of dealing with the timothy seed crop was to cut with the binder and stook, leaving the stooks to weather for 2 to 4 weeks. The crop is then threshed out of the stook. In these days stooking of any crop is the exception rather than the rule, labour being difficult to procure for this work. However, the old method is still probably the best for timothy seed.

For threshing, the old-type large wooden English mill with a clover huller attachment, in the hands of a skilled operator, was and still is the best mill for threshing timothy seed. (When this type of mill was used the sheaves were held in the drum to ensure clean stripping.) Alternatively, the "tin mill" with a peg drum may be used. It is necessary to have the concaves carefully set or there will be an excessive quantity of shelled seed.

In Southland yields of nearly 1000lb. per acre have been harvested, but a good yield is up to 250lb. per acre of machine-dressed seed.

About 1200 acres of timothy are being harvested annually for seed in New Zealand at present. Formerly Southland was the main producing province, but with the increase in production of Certified seed of improved strains Otago and Canterbury Provinces, particularly Ashburton County, are coming into prominence.

On one farm in the Eiffelton district of Ashburton County 100 acres were sown out immediately after the release of seed of superior strain. This area averaged 222lb. of machine dressed seed per acre in the 1946 harvest and 349lb. in the 1947 harvest. In 1948 only half the area was saved for seed and yielded 268lb. per acre. The land was used previously for cocksfoot seed harvesting and is of a soil type typical of the large area in this locality used for the production of cocksfoot seed. The timothy was sown with Montgomery red clover, which it quickly smothered over most of the area, resulting in a strong timothy stand.

A timothy seed crop.

On this farm different methods of harvesting have been tried, and cutting with a binder, stacking, and threshing is considered a better method of saving the seed than threshing with a header harvester from the windrow because of the long time required to condition timothy seed.

The seed is easily dressed, the chief impurities being Yorkshire fog and goosegrass, both of which are easily removed from timothy with modern seed-cleaning machines. In the past white clover was a troublesome impurity in timothy seed, but now, with better management of seed-producing areas, timothy practically excludes low-growing plant life and consequently white clover is not as troublesome.

Use in Pastures

Timothy seed is used in pasture seed mixtures in all localities of New Zealand where the grass thrives. Though it is sown in many pastures, consumption of the seed is not high, as the seed is very small, and generally not more than 2lb. per acre is sown with a perennial ryegrass-cocksfoot-clover mixture; 6lb. per acre is about the maximum seeding when timothy replaces cocksfoot in the mixture.

Timothy withstands heavy winter poaching; in fact, such treatment is beneficial to seed-producing areas. Stock grazed on such an area during winter are allowed free access to the stacks of threshed straw, and thus much of the nutriment from this roughage is returned to the soil in the form of dung.

Timothy is not much troubled by fungi or insect pests, but attacks of some consequence have been made by an army worm, *Persectania ewingi*. This caterpillar climbs the stalk and feeds on the seed head, thus reducing the yield.

The production of timothy seed of superior strain to meet New Zealand requirements is worth while. Whether or not an export market can also be developed remains to be seen.

Rearing Orphan Lambs

By D. W. CALDWELL,
Veterinarian, Department of Agriculture, Hamilton

MOST sheep farmers are familiar with the problem of mothering up a lamb whose mother has died or whose mother cannot feed it owing to udder defects or disease, or a lamb which is a triplet or twin and which is to be put to a ewe which has lost her own lamb. Advice on the best methods to adopt is given here, with instructions for making an artificial colostrum for lambs deprived of the natural colostrum so important for the first days of life.

WHEN any lamb is doing badly an examination should always be made of the ewe's udder, as this is commonly at fault and the strongest lamb will not live long without food.

Many shepherds have their own particular method of mothering up. The best known are briefly as follows:—

1. When a lamb has died and there is a lamb to be fostered the dead lamb is skinned and the skin fastened over the orphan lamb so that the ewe which has lost the lamb will accept it without question. This acceptance is largely a question of smell, though as the lamb grows older the skin can be taken off without disturbing the relationship now firmly established. This method is excellent, but depends on having the recently dead lamb for skinning.

2. The ewe is tied with a short piece of string to a fence post by a foreleg or the neck so that she has little freedom of movement, and the introduced lamb is held to her for feeding. She is left tied up for a day at least and the lamb is allowed to feed several times.

A quiet "eye" dog is useful in this method, as it can be brought up to within a few yards to hold the attention of the ewe while the lamb is feeding; also the ewe's protective instinct is aroused by the presence of the dog and she accepts the strange lamb more readily. The neck string must be removed later, or it will cause trouble at shearing time.

3. The ewe is taken to the woolshed and fastened in a small bail alongside the wall with a feeding box in front so that she can be held there for several days during which the lamb can feed freely without the ewe being able to reject it. After a few days the ewe is turned loose and keeps the lamb as her own.

On one large and well-managed fat lamb farm in the Waikato this method is used with good results. Ewes without lambs and motherless lambs are brought into the woolshed in a truck and the mothering up done there by this method, which is most efficient on a large property where the ground allows a truck to be run round the lambing paddocks to pick up ewes and lambs in need of attention.

Whatever method is used, the shepherd should carry two or more coloured raddles and mark the ewes and introduced lambs in some distinctive way so that each pair can be identified until each ewe accepts the strange lamb. Liquid raddle in plastic bottles is now available for marking and is much more convenient and practical than the older preparations.

Artificial Colostrum Mixture

The most important point is that the newly born lamb must have the colostrum or first milk, or its equivalent, or its chances of survival are very poor. This became very evident during experimental work at the Department of Agriculture's Wallaceville Animal Research Station when lambs were removed at birth from their mothers and rearing was attempted by various methods.

Briefly, this happened:—

(a) When lambs were fostered on to ewes which had been in milk for 3 or 4 weeks the lambs failed to put on weight and died after 3 days.

(b) Other lambs were fed cow's milk, and they also died in about 3 days owing to the formation of large indigestible clots in the stomachs and retention of the foetal dung, which is in the back passage before birth and must be excreted.

(c) Other experimental lambs were fed cow's milk and then fostered on to ewes in full milk and these died after 7 days. Post-mortem examinations again showed hard, rubbery clots in the stomachs and that the foetal dung had not been passed.

(d) Finally it was decided to make up an artificial colostrum, as the experiment depended on the lambs not receiving their mother's first milk, and a mixture was prepared with 1 beer bottle of warm cow's milk, 1 beaten egg, 1 small teaspoon of cod liver oil, and 1 dessertspoon of sugar.

The mixture was fed at about 6oz. a feed four times a day for the first 48 hours, and all lambs so fed put on weight, passed their foetal dung, and thrived when fostered on to ewes in milk.

Where it is desired to continue rearing a lamb on the bottle longer than 48 hours the correct mixture is 4 parts of milk to 1 part of lime-water or water with a dessertspoon of sugar added to each pint. Four feeds a day should be given for the first fortnight, then three feeds a day, and at 1 month old two feeds daily are sufficient. The amounts should be increased gradually as the lamb grows, but the lamb should not be overfed. Very few bottle-fed lambs die of starvation, but many die from overfeeding and at the best suffer from chronic indigestion.

Lesson to be Learnt

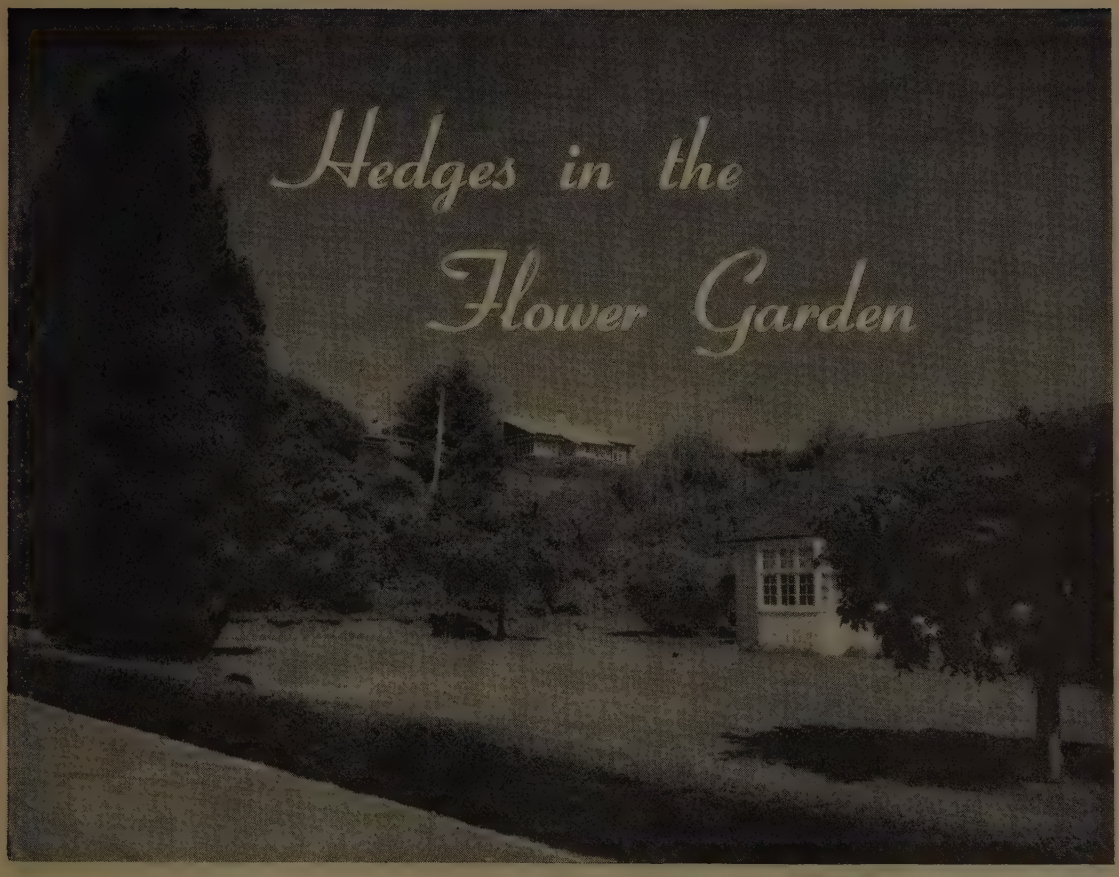
The lesson to be learnt from these observations is that a lamb to survive must be given colostrum from a ewe or the artificial colostrum made up as described. A ewe secretes colostrum for 48 hours after lambing and much work will be wasted and many lambs lost if time is spent trying to mother newly born lambs on to ewes which have been in milk for more than 2 days. Some shepherds will look out for and catch a freshly lambed ewe and hold her for a motherless lamb to suckle, but this is unnecessary if the simple mixture described is used, the ingredients for which are to be found on every farm and the making up of which should present no difficulty. Castor oil can be used in place of the cod liver oil in the first bottle. By the use of this mixture many more lambs will be successfully reared.

New Edition of "Primary Production"

THE Department of Agriculture's publication "Primary Production in New Zealand" has established a reputation as a particularly useful reference book not only for students from post-primary standard onward but for financial and mercantile firms who require basic farming information. The fourth (1957) edition of this book has just been published.

Organisation and methods in all the main primary industries are described, and there are comprehensive sections on export and local marketing. Detailed information on the guaranteed prices for dairy produce and of the price-support schemes for wool and meat is included.

"Primary Production in New Zealand" is available from main offices of the Department of Agriculture for 2s. 6d. per copy.



Hedges in the Flower Garden

HEDGES serve many useful purposes, ornamental as well as practical, and consequently are dominant features of many home gardens. Because their prominence attracts attention, their condition is of major importance where they are used extensively. Well-kept hedges of carefully chosen species can blend into the garden plan, whereas the discordant effects created by unsuitable or ill-kept hedges cannot be masked even in the best of gardens. This article by J. S. Say, Horticulturist, Department of Agriculture, Auckland, deals with the selection, planting, and maintenance of hedges in the home garden. The notes on work in the flower garden in July are by Rosalie A. Campion, Horticultural Instructor, Department of Agriculture, Wellington.

MOST people think of hedges as a means of giving protection of some kind, from wind or wandering animals, or the gaze of passersby or neighbours. This severely practical approach with little imagination in the selection of suitable plants has resulted in common, hardy plants such as privet and *Chamaecyparis lawsoniana* being so widely planted as to become monotonous.

Though protection is the primary function of hedges, they may be given far more importance in garden design. There is no reason why beauty should be sacrificed to utility. Hedges can be used as backgrounds to flower or shrub borders or as divisions between different sections of the garden; for example, between the vegetable and the flower gardens. With suitable plants they can be used as ornamental features in their own right by providing colour with leaves, flowers, and berries.

Types of Hedges

Hedges may be grouped into two main types, formal and informal.

Formal, trimmed hedges are by far the most common. They are a legacy from the old custom of surrounding homes and gardens with tall, dense hedges to give complete privacy even at the cost of cutting out sunlight and views.

For some sections or parts of sections formal, trimmed hedges are still the most suitable as screens or as protection against wind. In many circumstances they give the greatest measure of protection while taking up the least amount of space, but it is seldom

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HEADING PHOTOGRAPH: In many gardens a dwarf hedge is sufficient to define the boundary without giving an enclosed effect or blocking the sun and views. Here *Lonicera nitida* has been used. In the background a border of shrubs and small trees provides an attractive setting to the house and garden and screens off a street. Photograph by Sparrow.

[*Elmar*

A line of mixed evergreen shrubs of various heights, shapes, and colours used as an informal screen.

either necessary or desirable to grow the all too common massive, dark hedges of earlier days.

Formal hedges of low to medium height are ideal for defining boundaries or as dividing lines within gardens without giving a completely enclosed appearance. They make excellent backgrounds for formal gardens and are comparatively easily maintained in good condition.

Tall formal hedges also have their uses principally as windbreaks. Their greatest disadvantage lies in the amount of maintenance work required. The need for regular and careful trimming is greater if the undesirable features of width and heaviness are to be avoided.

As with other trees and shrubs the choice of suitable hedge plants may be restricted by soil and climate, but the most attractive species in the available range should be chosen.

Informal hedges may be rows of shrubs or small trees whose natural growth habit and height are such that they may be left untrimmed. A row can consist of one or more species. The screening and protective functions of hedges may also be provided in an attractive form by the shrub borders. The latter practice gives the greatest scope for effective planting and can be used in most large gardens and is by no means impossible in small sections.

Less formal protection demands more careful planning, but there is much more scope for imaginative planting, the result is more pleasing, and neither protection nor privacy need be sacrificed.

Formal and informal plantings may be used in different parts of the same garden and, with thoughtful planning of the whole, can be made to blend one into the other.

Selection

The selection of suitable plants for a hedge usually receives far less thought than is given to the choice of any other plants. Apart from the choice of salt-resistant plants for the seaside, it is only on rare occasions that the gardener considers the many

[*Sparrow*

Shrub borders can often be used instead of formal, trimmed hedges to give privacy and at the same time add much to the attractiveness of the garden. Here effective use is made of a planting of mixed shrubs along the street frontage and on the dividing line between sections.

[*Elliott*

Abelia produces masses of pink flowers which are followed by red bracts in autumn and winter. Where a strictly formal hedge is not desired a hedge of this kind can be left untrimmed until after it has flowered, for it can make a colourful feature in the garden.

other points necessary for the establishment of a good hedge.

The first point to be considered is whether a hedge is really necessary. Very frequently hedges are put in just as a matter of course. They serve no useful purpose and could well be done without. For example, hedges round the front boundaries of town sections are often unnecessary, for very few people wish to be completely screened from the street, and hedges less than 6ft. high are not effective screens. Anything less than this can be overlooked and the purpose of the hedge is defeated. In such cases dwarf hedges or groups of shrubs are sufficient to define the boundaries, and the appearance of the street as a whole is improved by the absence of large, often unsightly hedges of various heights, shapes, and conditions. On sloping sections it is difficult to screen off the house from the road and in such positions, too, hedges are often of little use as windbreaks unless they are very tall.

If a hedge is necessary or desired, its exact purpose should be decided; that is, whether it is to be a windbreak, a screen, a background, a boundary, or an ornamental feature. It may combine any two or more of these functions. Once the purpose of the hedge is defined the type and other characteristics can be considered.

The next point to decide is whether it should be formal or informal. Only about a dozen species of plants are commonly used for trimmed hedges in New Zealand, but many other plants would be suitable. Formal hedges require plants with small, dense foliage and of compact growth. They must be able to stand frequent clipping and produce abundant short growths, even if slowly, and be resistant to or tolerant of attacks by pests and diseases.

Nearly all conifers, though fulfilling most of these conditions, are unsuitable for small gardens because they are liable to die out if trimmed too hard. Plants with large leaves are usually unsuitable for formal hedges because they do not quickly reclothe with foliage after being trimmed, but coloured and variegated leaves can be used in selected positions. A hedge of golden euonymus, for example, can be used as a feature in the garden, but would be unsuitable as a background to a rose garden.

Many shrubs can be used for informal hedges. In fact almost any shrub with a reasonably compact habit of growth and dense foliage can be used. Shrubs with coloured or variegated foliage, flowers, berries, or autumn colour are the most suitable. Evergreens are preferred for single-row hedges, but deciduous shrubs can be included in shrub borders.

The selected variety must be able to reach the required height, but it is most important to choose one which can be easily maintained at that level. Even with frequent clipping many hedges tend to grow too large and eventually have to be cut back severely, often with disastrous results. With informal hedges the required height should be maintained with the minimum of pruning.

When hedge plants are being bought it is always advisable to ensure that they are suitable for the soil and climate. Most of the commonly grown ones are fairly tolerant of a wide range of soil types, but will not stand poorly

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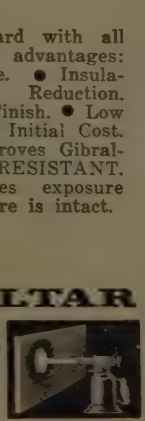

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For Travel Pleasure

NEW ZEALAND RAILWAYS

Unless hedge plants are well furnished to the ground when planted they should be pruned hard back to encourage a mass of shoots low down. This 2-year-old hedge of *Euonymus japonica variegata* has become bare at the base through lack of correct pruning.

drained positions. On sandy, dry, or continuously moist soils extra care must be taken in the selection. Tender plants should not be planted in cold climates and salt-resistant varieties are necessary near the sea.

Planting

Probably no other group of plants receives such scant attention as hedges at planting time. As a rule the first thought of owners of new sections is to plant hedges, and plants are put in with little or no soil preparation. Too often the result is that many die and the remainder struggle on but never make satisfactory hedges. It is far better to miss a season so that the position can be prepared, for in the end a satisfactory hedge will be established in a shorter time. A hedge is a permanent feature of the garden and deserves the best treatment. Drainage is essential and should be attended to first, but tile drains should not be laid beneath or near hedges, because roots soon block the tiles.

At least 2 months before the usual planting season a 2ft. wide strip should be dug as deep as the topsoil allows and the subsoil loosened. A good dressing of a balanced fertiliser should be worked in and some organic matter

A well-trimmed escallonia hedge. → The neat appearance would be improved by the removal of the old fence posts. At the end of the lawn a tall hedge of *Chamaecyparis lawsoniana* is used as a background to the flower garden.

Another example of shrubs and trees used in place of a high hedge. Tall deciduous trees have been used among the evergreens to give high shelter without blocking out the sun in winter.

if it is available. Planting times and methods discussed in articles on trees and shrubs in the April and May issues of the "Journal" apply equally to hedges.

Distance apart depends on the growth habit, size, and purpose of the hedge; 12in. to 18in. is usual for dwarf and medium-sized species and 2ft. to 3ft. for taller ones. Generally it is better to overplant than underplant, for the plants grow together more quickly and a close-knit hedge is established in a shorter time. Recommendations for shrub borders, which may be used instead of more formal hedges, were given in last month's issue of the "Journal".

Care after Planting

Watering and weeding should not be be neglected, especially during the first 2 or 3 years. To encourage good, vigorous growth a slow-acting, balanced fertiliser should be applied each spring until the hedge is well established. Only on poor soils are regular applications of fertilisers necessary for established hedges. Mulches of organic matter are also helpful in the early years.

Training and Trimming

Unless the plants, when received from the nursery, are compact and bushy with good root systems, they should be cut back fairly severely at planting time to encourage a mass of young shoots low down. During the first summer they should be treated as individuals and the tips of the shoots pinched out at an early stage. If this is not done, they should be pruned fairly hard in winter or spring 12 months after they are planted. Individual treatment may be necessary for a further year, but after that the hedge can be treated as a whole and trimmed with shears.

The foregoing recommendations do not apply to conifers, as the majority will not stand hard cutting. With them it is most important to trim the sides from an early stage to encourage a bushy habit and to prevent the hedge from becoming too wide at the base and then having to be cut back hard into old wood which does not readily refurnish with new growth. This is one reason why many hedges of *Chamaecyparis lawsoniana* are bare at the base.

Early pruning is best done with secateurs. Well before the required height is reached conifers should be tipped and the resultant side shoots regularly pinched to encourage a well-furnished top which will grow up in an even line. If they are not tipped until the required height is reached, it is often difficult to fill in the top and maintain the required height.

All formal hedges should be slightly wider at the base and slope in to the top to maintain growth low down. Once a hedge becomes bare at the base through faulty pruning, or because it has been smothered by weeds or garden plants, it is almost impossible to force new growth. Trimming of hedge tops is a matter of personal preference, for rounded, flat, and pointed finishes are equally good.

The time for clipping depends on the plants used. Most evergreens should be trimmed every 6 to 12 weeks during the growing season and conifers more often. Frequent light clipping is far better than one or two hard trimmings a year. The hedge will remain in better condition and will not tend to get larger and larger each year.

Hedge plants such as abelia and escallonia may be trimmed less frequently to take advantage of their profuse flowering habit. Escallonias should be trimmed after their main flowering period, but abelias should be left until spring, as the coloured bracts which follow the flowers make a bright show in the winter garden. Formal neatness is sacrificed, but the effect is worth while.

Plants such as *Tecoma capensis* with a semi-climbing habit of growth do not produce rigid upright frameworks of branches, and are unsuitable for heights above 3ft. unless they are supported. Strong wire fences with very durable posts set in the centres of the hedge rows are the most suitable supports.

Pests and Diseases

Some hedges are good breeding grounds for a number of pests and should be sprayed at the same times as other susceptible plants in the garden. Thrips and scales are particularly bad and can seriously disfigure or debilitate hedges, and there is little hope of keeping other susceptible garden plants free of them when an infested hedge acts as a source of infestation. Fungous troubles are usually not serious.

Garden Work for July

July is the best time for planting, pruning, and winter spraying of roses. The plants should be put into their permanent positions as soon as possible after they have been received from the nursery. If planting must be delayed because of soil or weather conditions, the sacking round the plants should be untied and the plants heeled in in a sheltered place.

Planting Roses

It is desirable that the bed be prepared several months before planting time, so that it is consolidated and the

Pruning methods: Left—A hybrid tea rose insufficiently pruned. Little other than flower heads have been removed. Middle—Pruned lightly, the more modern method. Right—Pruned severely, the older method, which is being replaced.

organic matter has decomposed to a suitable state. The planting hole must be sufficiently large to take the roots of the rose fully spread out, and deep enough to bring the bud union just below the surface of the bed. When planted the roots should normally be covered with not more than 6in. of soil, and it may be necessary to have the bud union higher above the soil surface to achieve this. A dressing of 4oz. of blood and bone should be worked into the bottom of each hole.

Where standard roses are being planted the stake should be driven into the hole before the plant is placed in position. Stakes made of angle iron and painted dark green or brown are more durable and quite as attractive as wooden stakes. All stakes for standard roses should be set so that the tops are at a uniform level, which should be just below the bud union.

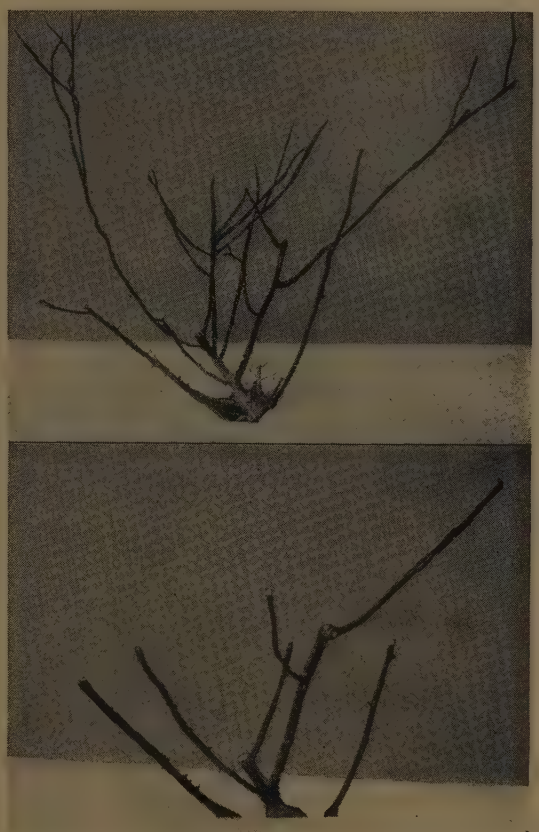
In windy areas the staking of bush roses should be considered, as no plant can thrive while swivelling around on its stem. Old nylon stockings are excellent for tying, and it is important that one of the ties should be close to the head of the plant to prevent damage and the possibility of its snapping off in strong winds.

Where roots have been damaged they should be pruned back into firm wood. When the plant is set in position one or two spadesful of soil should be spread over the roots and the plant lifted slightly. If this operation is repeated, the soil will be well worked in among the roots. When the hole is nearly full the soil should be firmed by tramping. Finally, more soil should be added, tramped again, and levelled off. In heavier soils the tramping may be omitted at planting, but should be done in spring.

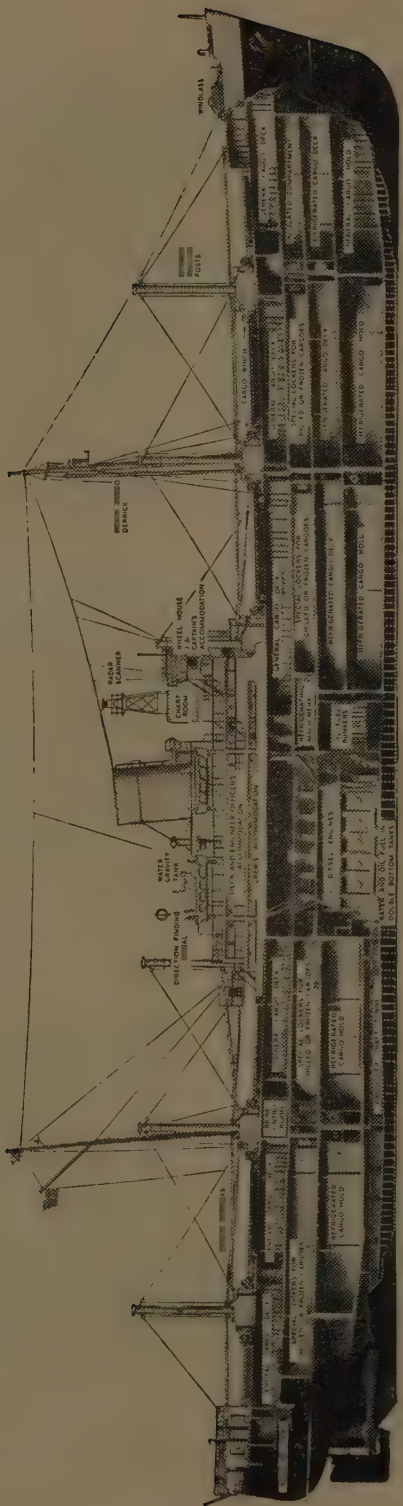
Rose Pruning

Contrary to a popular belief, rose bushes usually are not pruned when they come from the nursery, and so pruning should be done at the normal time.

In warmer northern districts, where there is little danger of frosts, pruning should be completed during July. In colder districts it is best left until August, so that growth does not begin until the risk of damage by late frosts is reduced. Pruning secateurs must be sharp so that clean cuts can be made. This is most important in helping to prevent the serious attacks of "die-back" which are prevalent in New Zealand. Pruning cuts should be made to an outside bud, the cut sloping from ¼in. to ½in. above



When hybrid polyantha roses are being pruned old wood should be removed and new wood long pruned.



The inside story

You see her every day—and you probably take her for granted. She's one of many—a typical 11,000-ton refrigerated cargo ship of one of the Overseas Lines and a good example of the ships that form the back-bone of the service.

But let's take the lid off her and have a closer look:

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7,000 TONS OF STEEL were used in her construction—that's more steel than they're using in the construction of Auckland Harbour Bridge.

TO PROTECT THE STEEL from corrosion, her builders used 40 tons of paint. With that quantity, you could paint 1,500 houses.

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HER TOTAL CARGO CAPACITY is 775,000 cu. ft. which would completely fill the Wellington Town Hall from floor to ceiling one-and-a-half times. There she is—your good and faithful servant; and before she sails away, let's look at one more figure. To build, this ship cost over £2¼ million, which is about five-and-a-half times as much as she would have cost before the war. Her useful life is still only about 25 years—and who knows what will be the cost of replacement in 1982? But, whatever the amount, it must somehow or other be set aside by the Lines out of the earnings during the short life of the ship. The task becomes no easier with the passing of time. But, easy or difficult, it must be done; always, as a ship comes to the end of its useful life, another must be ready to go into service . . . *into your service.*

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the bud on the bud side to a point level with the bud on the opposite side.

The first task when pruning roses of any type is to remove all dead, diseased, or crossing branches. Watershoots or vigorous autumn growths can be completely removed, but if they add to the framework of the plant, only the seed pods should be removed. Cutting into unripe wood may induce die-back, and this wood should be removed entirely or left unpruned until after flowering.

Newly Planted Roses

Newly planted roses should be pruned as follows. The widely used bush roses of the hybrid polyantha and hybrid tea types should be pruned back hard to an outside bud. Any weak shoots should be removed entirely. Species and miniatures should not be pruned as severely, but should be trimmed to correspond with any necessary root trimming. Climbers should not be pruned severely, but should be neatly recut above the top bud. Hard pruning may induce a climber to revert to the bush form of growth.

Bush Roses of Hybrid Tea, Tea, and Hybrid Perpetual Types

In the past severe pruning has been widely advocated for hybrid tea, tea, and hybrid perpetual types of bush roses, but the advantages of a less severe pruning are being realised. Growths should be shortened back by one-third to half their length. Very vigorous varieties such as Peace should be pruned more lightly and weaker growers should be pruned more severely. Standards of the same type should be pruned similarly but a little more severely.

Bush Polyanthas, Floribundas, and Grandifloras

The pruning of these types entails the removal of much of the wood which is more than a year old and a slight shortening back of the new wood. With standards pruning should be more severe.

Climbing Roses

The aim should be to replace as much flowering wood as possible with strong shoots produced last summer. Where older wood must be retained the side shoots should be cut back to two buds. All growths should be tied down as close as possible to a horizontal position. It will be found easiest if all old ties are removed and the shoots placed afresh.

Climbers of the Paul's Scarlet type need little pruning other than the shortening of the laterals. Ramblers of the American Pillar type, which have one flush of blooms each year, should be pruned after flowering by removal of branches which have flowered. The new growths can then be tied in place.

PRUNING OF ROSES

▲ A climbing rose before it is pruned.

▼ A climbing rose pruned and tied in.

Winter Spraying

Where scale insects are prevalent on the branches a spray of winter oil, 2 pints to 4 gallons of water, should be applied.

To assist in the control of black spot fungus, immediately after pruning or 2 weeks after the application of winter oil a fungicidal spray should be applied. Thiram, Bordeaux mixture, or copper oxychloride sprays are quite satisfactory.

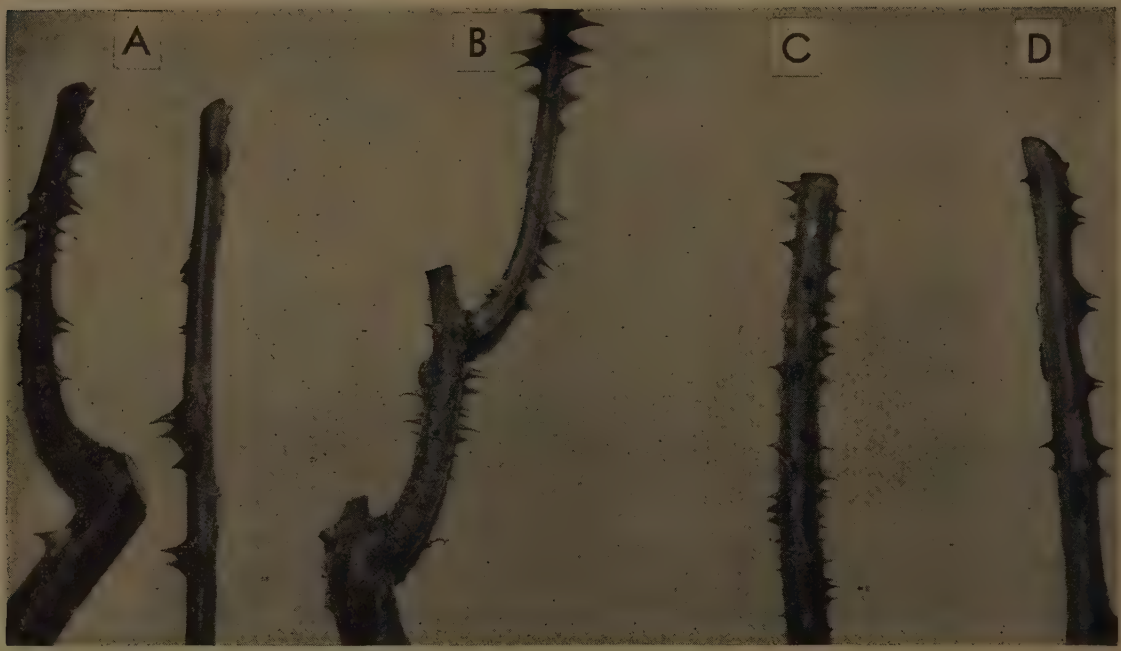
Seed Sowing in the Glasshouse

In a heated glasshouse July is the month for sowing seed of plants which take a long time to grow. Sow asparagus fern, making sure the seed is fresh, tuberous begonias, streptocarpus, and *Saintpaulia ionanthe*. As seeds of these plants are very small, they should be sown on well-sifted soil and not covered by any additional soil. The seed box or pot should be covered with a sheet of glass.

Pot Plants

The growing of pot plants is adding much interest to the lives of people who do not have a great amount of time for gardening or the replenishing of the floral decorations in the home. It is especially a pleasure at this season of the year, when flowers are not plentiful. A brief resume of tasks with these plants for July is given here.

Achimenes: Pot the rhizomes and start them into growth.



The right and wrong ways of making pruning cuts. A—Correctly pruned. The main cut is made just above a bud, slanting down on the opposite side. B—A branch which has not been pruned cleanly. C—The pruning cut is made incorrectly, straight across the branch. D—The pruning cut is slanting the wrong way.

Cyclamen: A light topdressing of a balanced fertiliser may help prolong the flowering season. Remember to use warm water and remove the flowers with a tug.

Heliotrope (cherry-pie): Cut back and start into growth.

Hoya carnosa: Keep dry and rested at a cool temperature of 50 degrees F.

Lippia citriodora (lemon-scented verbena): Prune back to old wood. Repot, if necessary, into a rich compost. Pinch back growing tips as necessary until December.

Impatiens sultani (balsam): Keep fairly cool and dry during the rest period, July to September.

Monstera deliciosa: Keep fairly dry.

Primula obconica: Do not place in draughts, give adequate light, and water carefully from the bottom because of the plant's susceptibility to collar rot fungus.

Streptocarpus hybridis: Start plants into growth and sow seed.

Vallota purpurea (Scarborough lily): Start bulbs into growth.

Variegated foliage plants: Plants of this interesting and varied nature should be put in a more sunny position during winter to intensify their markings.

Cacti and Succulents

Lithops may begin to shrivel at this time. This is natural, and they should be left quite dry. Other plants from which water should be entirely withheld are *opuntia* (the prickly pear), and aloes. Such plants as phyllocacti, epiphyllums, echeverias can be given one or two waterings this month as long as the water is **lukewarm**. The echinopsis or "sea urchins", a very hairy and free-flowering group, should be kept cold, but they like a little water. These are some of the most easily grown of the cacti and are good plants for beginners.

Cloche Gardening

Though cloches are not particularly artistic in flower gardens, by their use it is possible to extend the flowering season. They can be used profitably where an area of flowers is set aside for cutting, and at present could be covering the following plants:—

Freesias sown or planted in February and now about to bloom.

Daffodils, iris, narcissi, and tulips planted in March and cloched last month.

Gladiolus planted and cloched in late May.

Lily of the valley planted in autumn cloched in midwinter of the second season, and now being sheltered for flowering next month.

General Work for the Month

Consider the drainage of lawns. Aeration with a fork could be done now if this is necessary. Further levelling for spring sowing should be attended to.

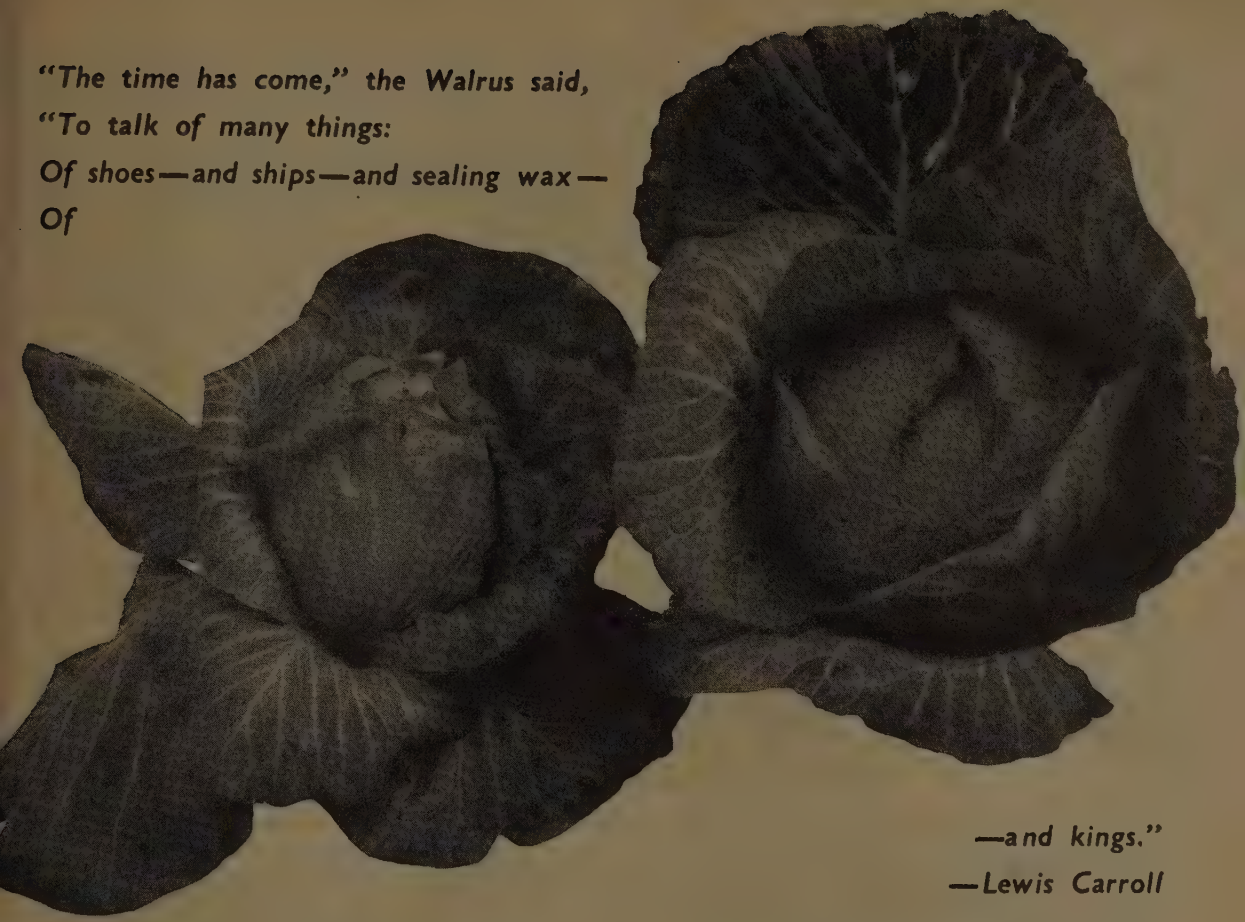
Compost heaps completed in autumn will probably be ready for turning.

Check all plant labels. An excellent selection of durable metal tags is available at reasonable cost.

Beds of plants for spring display can be lightly forked over to aerate the soil.

Give some protection to winter roses *Helleborus nigra* and *H. orientalis* and to *Iris ungicularis* (stylosa) as the flowers emerge. Dust around the plants with DDT or lindane or use a metaldehyde bait to destroy slugs and snails, which can be most destructive to the flowers.

Check supplies of fertilisers, seeds, tools, and spray materials and order more if required for the coming season.



By ELEANOR S. CAMPBELL,
Field Officer in Rural Sociology, Department of Agriculture, Auckland

THE humble cabbage, often, alas, so ill prepared and worse cooked, should rightfully take its place as one of man's best friends in the plant world. Cabbages may generally be divided into the smooth-leaved or curly-leaved classes, or they may be differentiated by their colours, white, green, or red. Nutritionally, they give very good value, being important contributors of vitamin C and some mineral salts. They also supply necessary roughage and are non-fattening.

CABBAGES can be grown all the year round and are often cheap. They are a very good standby in winter, when other vegetables are scarce.

It remains, therefore, for the housewife to prepare and cook the vegetable so that it retains the maximum amount of vitamins and is a palatable, attractive dish for the family.

For some people cabbage may be rather indigestible. Old, coarse, and stringy cabbages would be the worst, particularly the stalks and coarse, outer leaves.

Care in choice and preparation should obviate any unpleasant aftereffects for normal people with healthy digestions.

Preparation

Choose a fresh, firm, crisp vegetable with a good heart. Cut the cabbage with a sharp knife into halves or quarters and remove thick stalk or leaf ribs. Remove outer, discoloured leaves. Wash the cabbage carefully in cold salted water. (The addition of salt to the water helps to remove any small slugs or insects which may be between the leaves.)

To Boil

Shred the cabbage with a sharp knife, put it into a small quantity of boiling salted water in a saucepan, replace the lid, and cook quickly (about 10 to 15 minutes). Drain thoroughly. Properly cooked cabbage should retain its crispness and colour. Overcooked cabbage loses both, as well as its vitamins, and is also most unappetising.

Soda should never be added to the water.

Other Cooking Methods

Boiling, though by far the commonest way of cooking cabbage, is by no means the only one. Cabbage may be boiled, baked and stuffed, or eaten raw as in salads.

RECIPES

Below are some recipes which should give variety.

Cooked Cabbage Dishes

Cabbage and Tomato Casserole

3 cups of shredded cabbage (cooked)
1 green pepper
1 cup of fine breadcrumbs
1oz. of butter or other fat
2oz. of grated cheese

Tomato Sauce

2 tablespoons of butter
2 tablespoons of flour
½ pint of milk
4 or 5 cooking tomatoes
1 small onion (diced)
Salt and pepper to taste

(4 servings)

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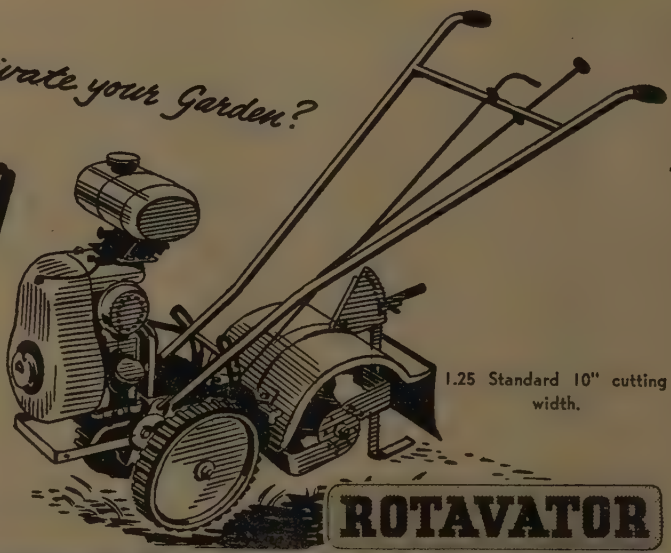

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To make the sauce melt the butter in a pan, add the flour, and mix to a smooth paste. Add the milk and stir continually until the sauce thickens and boils. Cook gently for 2 or 3 minutes and set aside. Stew the tomatoes until soft, add salt, and sieve the tomatoes. Saute the onion in a little fat. Add the onion to the tomato puree and add the puree to the white sauce; season with pepper and salt.

Cut 2 or 3 thin slices of green pepper and chop the rest up finely. Discard the hard centre of the pepper. Put a layer of cooked cabbage in a casserole dish and cover with the tomato sauce, chopped green pepper, and grated cheese. Continue with alternate layers of cabbage and sauce and cheese. Cover the top with sauce and decorate with slices of green pepper and grated cheese. Sprinkle the breadcrumbs on top, dot with the 1oz. of butter, and bake in a moderate oven (350 degrees F.) until the top is brown.

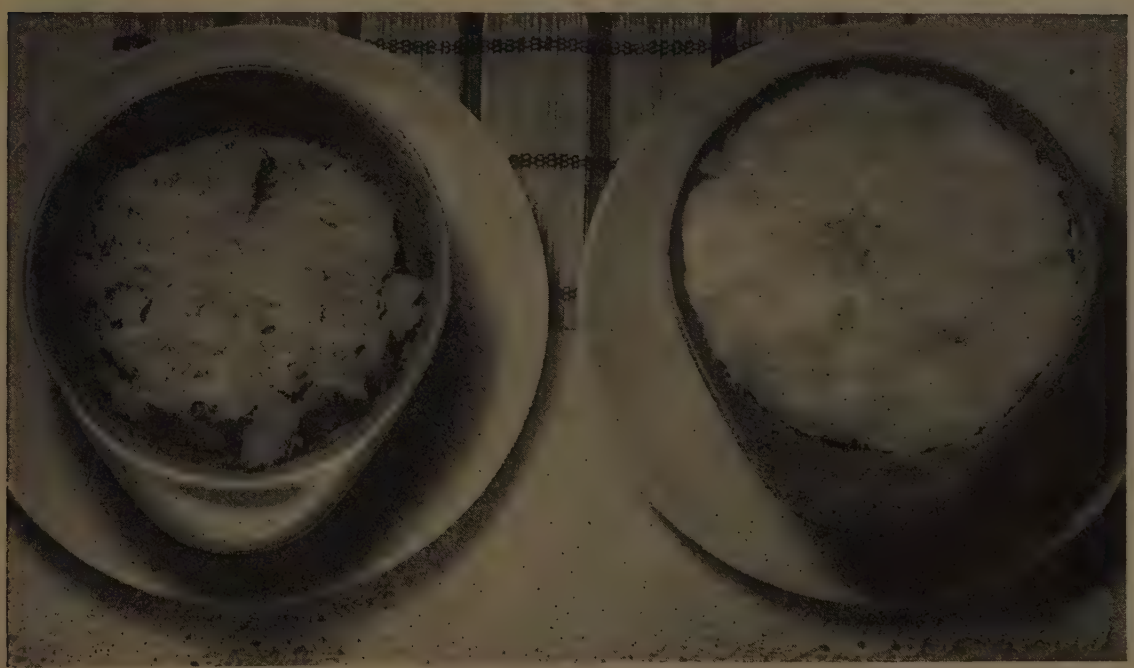
Braised Cabbage

1 firm small cabbage	1 medium-sized onion
1 carrot	1 cup of stock
Pepper and salt	¼lb. of fatty bacon rashers

(4 servings)

Trim off the outer leaves of the cabbage and wash the cabbage well. Plunge the whole cabbage into boiling salted water for 10 minutes, drain, and allow to cool. Separate the leaves, removing the stalks and ribs of larger

Cabbage and tomato casserole.



▲ Sauerkraut.

▲ Scalloped cabbage.

Over 11,000 Tons of Salt Produced at Lake Grassmere Near Blenheim this season

The production of "Pacific Salt" by Dominion Salt Ltd. is now an important industry. The demand for New Zealand salt for agriculture and industry is constantly increasing.

The photograph above was taken on the occasion of the first visit of the Minister of Industries and Commerce, Mr. E. H. Halstead, recently to the Dominion Salt Ltd's undertaking at Lake Grassmere, near Blenheim. With him are directors of the company, from left to right: Mr. G. R. J. Hope (Wellington), Mr. P. J. Skellerup (Christchurch, Managing Director), Mr. Halstead, Mr. W. G. G. Cuddon (Blenheim), Mr. S. E. West (Works Manager), Mr. K. C. Campbell (Wellington), Mr. R. D. Sutherland (Secretary to the Minister), Mr. J. J. Craddock (Secretary of Dominion Salt Ltd.), and Mr. J. R. Templin (Christchurch).

With the South Island Main Trunk Railway passing through the centre of the Lake Grassmere area, transport to the railhead presents no problems. In some instances, ships have been chartered to carry the salt from Picton to North Island ports.

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leaves. Line a casserole dish with strips of fatty bacon, place the leaves on top with slices of carrot and onion, season with pepper and salt, and pour the stock over. Cover with bacon rashers. Place a lid on top of the casserole dish and cook in a moderate oven (375 degrees F.) for about 2 hours.

Cabbage Hot Pot

1 medium-sized firm cabbage
2 medium-sized onions
1lb. of potatoes
2oz. of butter
Salt and pepper

(6 servings)

Trim and wash the cabbage. Shred and boil in small quantity of boiling salted water. Peel and parboil the potatoes. Peel and chop the onions and fry until a golden brown. Grease a fireproof dish and arrange layers of cabbage, onion, and potato in it. Season. Put a layer of sliced potato on top. Dot with butter, cover, and cook in a moderate oven (375 degrees F.) for about ¾ hour. When the hot pot is cooked remove the lid and leave the dish in the oven for a few minutes to brown the potatoes.

Cabbage Pie

1 medium-sized firm cabbage
6 large tomatoes
1 or 2 onions
2oz. of butter
½ cup of bread-crumbs
Salt and pepper

(6 servings)

Trim and wash the cabbage. Cut in halves, but do not shred. Boil quickly for about 10 minutes. Drain the cabbage and keep the liquor for vegetable stock. Peel and slice the tomatoes and onions.

Place in a casserole layers of cabbage leaves, tomato, and onion. Season each layer and dot with butter. Finish with a layer of tomatoes, sprinkle with breadcrumbs, dot with butter, and bake in a moderate oven (375 degrees F.) until golden brown (about ½ hour).

Scalloped Cabbage

3 cups of shredded cabbage
1oz. of grated cheese
½ cup of bread-crumbs
½ pint of white sauce
1oz. of butter
Salt and pepper to taste

(4 servings)

Cook the cabbage quickly in a little boiling salted water. Drain well and season with salt and pepper. Add a dot of butter. Put into an oven-glass dish, mix with white sauce, sprinkle grated cheese and then breadcrumbs on top, and dot with butter. Brown in a moderate oven (350 degrees F.) for about 20 minutes.

Stuffed Cabbage

1 medium-sized firm, round cabbage
1 dozen chestnuts or 4oz. of breadcrumbs
8oz. of sausage meat
2 small onions (chopped)
1 tablespoon of chopped parsley
1oz. of melted butter
1 beaten egg
Pepper and salt
1 pint of stock

(6 servings)

Trim and wash the cabbage carefully, leave whole, and boil in salted water for about 15 minutes. Drain well. Cook, skin, and chop the chestnuts (if used), mix with the sausage meat, onions, parsley, seasoning, butter, and egg. (If chestnuts are not used, replace with breadcrumbs.)

Cut the cabbage down the centre to open it, put stuffing in the centre, and open out the leaves, placing stuffing between them. Re-form the cabbage into a firm, round shape. Wrap the cabbage well in greaseproof paper, place it in a baking tin, pour stock round it, and bake it in a moderate oven (350 degrees F.) for 1 to 2 hours. Baste frequently with stock.

Stuffed Cabbage Leaves

1lb. of stewing beef or veal
2oz. of uncooked rice
1 small onion (chopped)
½ teaspoon of mixed herbs
½ cup of milk
8 large cabbage leaves
2oz. of butter
Salt and pepper
½ cup of sour cream
1 tablespoon of tomato ketchup

(4 servings)

Stew the uncut meat with the rice and onion. Season with salt and pepper. When the meat is tender strain off the stock and keep it. Cool and mince the meat and add rice, onion, mixed herbs, salt, and pepper. Remove any hard stalk from the cabbage leaves, dip the leaves in boiling water, fill each leaf with the rice and meat mixture, fold over, and tie firmly with string.

Spread butter round the cabbage rolls, place the rolls in a casserole, and pour the broth over them. Cover and bake in a moderate oven (350 degrees F.) for about 1 hour. Mix the sour cream, milk, seasoning, and ketchup, heat thoroughly, and serve as a sauce.

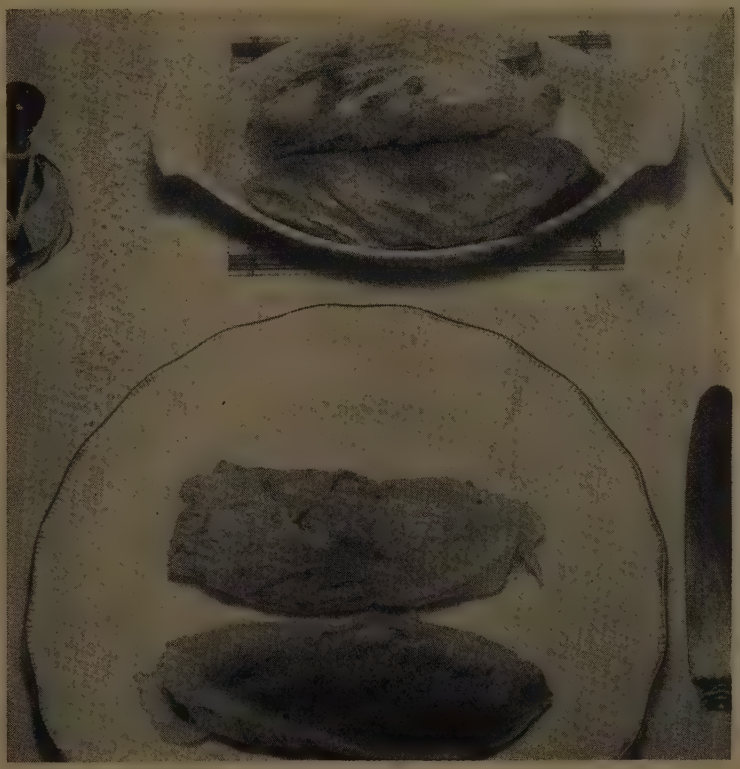
Cabbage Croquettes

½ small cabbage
½ pint of thick white sauce
Yolk of 1 egg
½oz. of butter
1oz. of grated cheese
½ cup of bread-crumbs

(4 servings or 8 croquettes)

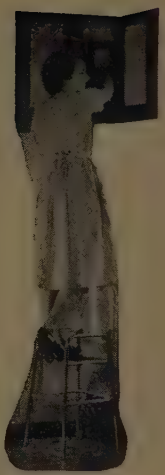
Trim and wash the cabbage well, cut in quarters, and place in a saucepan with a very small amount of boiling salted water. Add the butter, replace the lid, and cook until the cabbage is soft. Drain well, chop up very finely, and return to the saucepan until the moisture has evaporated.

Mix equal quantities of cabbage and white sauce to which the grated cheese has been added. Bind with the yolk of the egg and allow to cool. Shape into flat or round croquettes, brush over with flour, dip in milk or beaten egg yolk, roll in breadcrumbs, and fry in deep fat until golden brown.



Stuffed cabbage leaves.

COMFORT & SAFETY IN THE KITCHEN



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Recipes from Other Lands

Norwegian Creamed Cabbage

3 cups of shredded cooked cabbage
½ teaspoon of caraway seeds
½ cup of sour cream
Pepper and salt

(4 servings)

Mix well together and cook over hot water for 10 minutes.

German Cabbage

4 cups of shredded cooked cabbage
1 tablespoon of finely chopped onion
1 tablespoon of sugar
2 tablespoons of butter
2 tablespoons of vinegar

(4 servings)

Mix well, heat thoroughly, and serve.

Dutch Cabbage

4 cups of cooked shredded cabbage
1 tablespoon of melted butter
Salt and pepper
2 well-beaten eggs
¼ cup of heavy cream

(4 servings)

Mix all well together, turn into a greased casserole, and bake in a moderate oven (350 degrees F.) until well browned (about ½ hour).

Breton Soup

1 medium-sized firm cabbage
2oz. of carrot
2oz. of turnip
2oz. of leek
2oz. of celery
4oz. of onion
Sprig of parsley
½ teaspoon of dried herbs
2oz. of butter or dripping
1 quart of stock (veal, mutton, or chicken)
Seasoning

Wash and peel the onions, turnips, and carrots. Wash and shred the cabbage. Chop the onions, leeks, and celery; dice the carrots and turnips. Heat the butter in a saucepan, add the vegetables, season with salt and pepper, and fry gently for about 5 minutes. Add the stock and finally the herbs tied in a muslin bag. Simmer gently until tender and remove the bag of herbs. Serve piping hot with croutons.

Cream of Cabbage Soup

1 medium-sized cabbage
½ pint of milk
2 pints of water
Salt and pepper
1oz. of butter
1 large onion
1 dessertspoon of sago or rice

Remove the outer leaves and stalk from the cabbage. Wash well and shred with a sharp knife. Peel and slice the onion. Put the vegetables into a saucepan with the water. Add salt, boil until soft, drain, and keep the vegetable water. Rub the vegetables through a sieve, return to the saucepan with the vegetable water, sprinkle with sago (or rice), add the butter and milk, season to taste, and simmer for 10 to 15 minutes or until the cereal is cooked. Serve hot with croutons.

Sauerkraut

Sauerkraut is a kind of fermented cabbage much esteemed in Germany. There it is generally served with frankfurter sausages, pork, boiled ham, or bacon. Sauerkraut can be bought at stores in tins. Below are two ways to serve this (1lb. of sauerkraut gives 4 to 5 servings):—

First method: Plunge the sauerkraut into boiling water or stock. Boil for 20 to 30 minutes. Drain well. Put in a pan with a knob of butter or bacon fat and heat through.

Second method requires:—

1lb. of sauerkraut (well drained)
½oz. of bacon fat or butter
Seasoning
½ cup of stock
1 apple (peeled, cored, and quartered)
Bay leaf

Melt the fat in a pan, add the apple, and cook gently until soft. Add the sauerkraut, moisten with the stock, and simmer gently in a covered pan until the cabbage is soft. Season with salt and pepper. If desired, 1 tablespoon of sugar may be added.

Cole Slaw

Cole slaw is a term used to denote very finely sliced cabbage. It may be tossed in salad dressing and used as a base for many different salads, or it may be served with other accompaniments. This should be called "cold cole slaw", or it may be served hot and called "hot cole slaw".

Hot Cole Slaw

1 tablespoon of butter
½ cup of water
1 medium-sized young cabbage (diced or shredded)
2 egg yolks
½ teaspoon of salt and pepper
¾ cup of sugar
½ cup of vinegar
1 cup of light cream

Melt the butter until frothy and add the water, cabbage, and salt. Cook the cabbage until it is tender, not soft. Combine the egg yolks, sugar, vinegar, and cream just before serving and pour over the cabbage. Heat to boiling but do not boil. Serve at once.

Cole Slaw and Welsh Rarebit

Toss with salad dressing 1 cup of very finely sliced young cabbage.

Welsh Rarebit (quickly made)

4oz. of grated cheese
Pepper, salt, and mustard to season
1 tablespoon of breadcrumbs
A little milk

Gently melt the cheese, add the seasonings and breadcrumbs, and add as much milk as the mixture will take up. Serve on crackers with cole slaw at the side of the plate.

Cabbage Salads

With cole slaw as a base many and varied salads can be quickly made,

Upper—Chopped peanut cole slaw. →
Middle—Cabbage and vegetable salad
Lower—Fruit and cabbage salad.

being very useful in winter, when lettuce is not available in some parts of New Zealand.

To toss the cabbage in salad dressing as directed in some recipes put the salad dressing in a bowl and then with two forks lightly toss the shredded cabbage in it so that the dressing coats the pieces of cabbage enough to taste but not enough to make them soggy.

Cabbage, Cucumber, and Egg Salad

3 cups of finely shredded cabbage
2 or 3 chopped chives
3 hard-boiled eggs
Parsley
1 cup of salad dressing
1 cup of diced cucumber
Salt and pepper

(4 servings)

Toss the cabbage in the salad dressing and mix the chives with it. Place neatly in individual salad dishes or pile in the centre of a large salad bowl. Pile the cucumber round the edge and on top. Decorate with slices of the hard-boiled egg and parsley.

Cabbage and Vegetable Salad

2 cups of finely shredded cabbage
Tomato (cut in quarters)
Salad dressing
1 cup of mixed raw carrot, celery, radish, and green pepper (diced, sliced, or grated)

(4 servings)

Mix all together, toss in salad dressing, and serve in neat piles garnished with tomato on top.

Fruit and Cabbage Salad

2 cups of finely shredded cabbage
Salad dressing
1 cup of mixed apple, apricots or peaches (tinned), pineapple, and banana

(4 servings)

Use a good red apple if possible and wash and dice it with the skin on. Dice or slice the other fruit, keeping aside a few slices or halves of peach or apricot for decoration. Mix all in with the shredded cabbage, and toss in the salad dressing. Serve individually or in one dish as preferred in neat piles. Decorate with peach or apricot halves and serve.

Cabbage and Cheese Salad

2 cups of finely shredded cabbage
Salad dressing
½ cup of cheese (grated or diced, as preferred)

(3 servings)

Mix all together and toss in the salad dressing.

Chopped Peanut Cole Slaw

3 cups of finely shredded cabbage
¾ cup of salted peanuts (chopped)
2 tablespoons of finely chopped chives
Salad dressing

(4 servings)

Mix the chives and cabbage together, add salt to taste, and toss in the salad dressing. Pile into salad dishes and make a circle of chopped peanuts round the edge and put a few peanuts on top.

Salad Dressing

A useful recipe for a salad dressing for cole slaw is:—

2 egg yolks
½ cup of sugar
2 teaspoons of butter
¼ teaspoon of salt
¼ teaspoon of pepper
2 egg whites
½ teaspoon of mustard
1 cup of cream or milk
1 cup of vinegar

Beat together the egg yolks, sugar, butter, salt, pepper, and mustard, add the cream or milk, and beat well. Beat the egg whites until stiff and fold in the other mixture. Cook in a double boiler until thick. Add the vinegar carefully, beating it well in.

Quickly Made Salad Dressing

½ tin of sweetened condensed milk
¼ teaspoon of pepper
¼ teaspoon of mustard
½ cup of vinegar or lemon juice
Milk to thin to desired consistency

Beat all the constituents except the milk together. If too thick, add the milk until the desired consistency is obtained.

All photographs by Sparrow.

Shadow Box for a Young Girl's Room

THE shadow box illustrated is an ideal display shelf for a young girl's room. Today there are an amazing number and variety of knick-knacks in the shops and many people have at least an embryo collection.

Boxes similar to the one illustrated can be bought; or if there is a carpenter, amateur or professional, in the family, one could be made very easily from plywood.

For hanging the box, small rings can be attached to the top edges at spacings matching those of the wall studs (usually 18in. centres) or dwangs (between-studs

[*Sparrow*

braces) so that nails to slip the rings over can be driven into the solid timber of the wall. Positions of studs or dwangs can usually be detected by lightly tapping across the wall surface. Indiscriminate driving of nails into the wall may damage the lining and provide very insecure hanging for the box.

The shelves of the box illustrated are painted white and the background is a pale pink.

—CHRISTINE LYONS, Field Officer in Rural Sociology, Department of Agriculture, Auckland

Trolleys and Trays

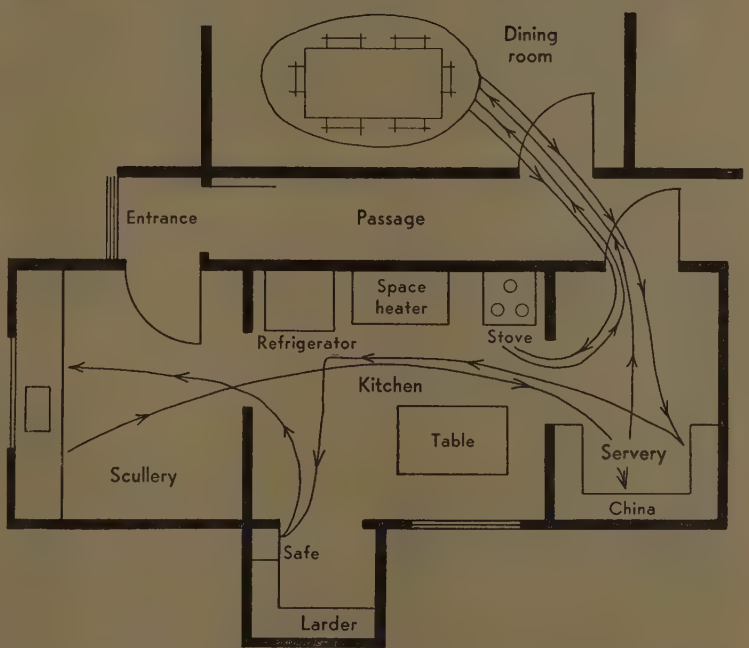
By ELEANOR COUSTON,
Field Officer in Rural Sociology, Department of Agriculture, Christchurch

THOUGH sometimes overlooked as a means of simplifying routine household tasks, trolleys and trays can play an important part in minimising effort. The use of wheels is one of the common-sense ways of saving steps and energy, and "mobility" in the home is worth considering. The familiar two-tiered trolley or dinner wagon often lies idle in a corner instead of being used to its full capacity as a valuable piece of equipment. For instance, if a trolley is used for the work involved in table setting, serving the meal, and clearing away, both steps and time can be greatly reduced, particularly in some large homes where the distances between scullery, kitchen, and dining room are considerable.

Trolleys

In the Kitchen

THE diagram on this page shows the layout in a large country home where the feeling of spaciousness is still appreciated, but where servants are no longer available. However, the owner serves her meals with little effort by using a trolley. One trip is



Layout of an extensive kitchen area where a trolley is used to great advantage for table setting, meal service, and clearing. The lines indicate how this is done with a minimum number of trips.

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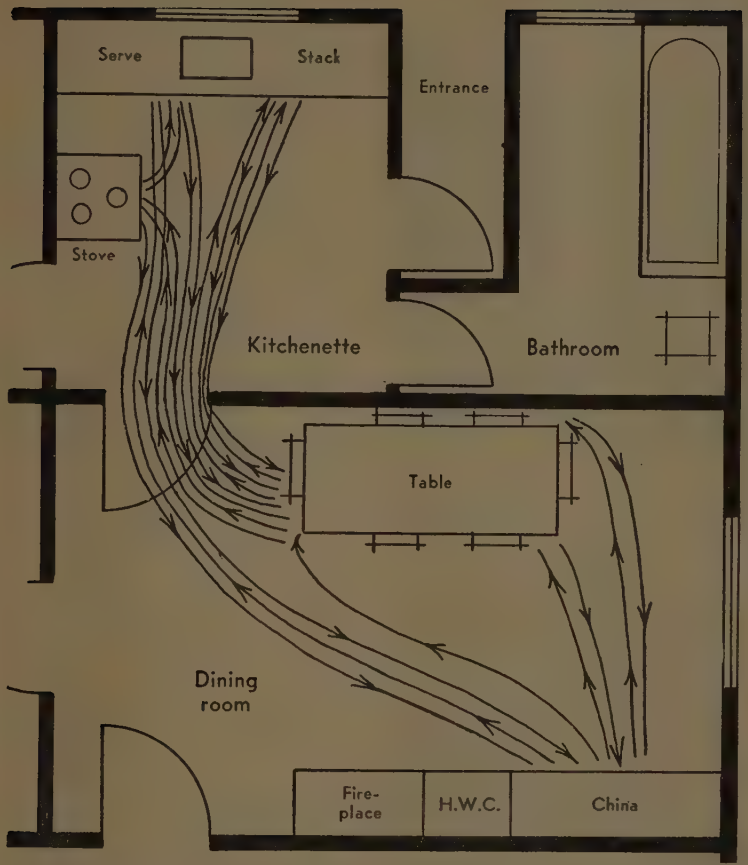

The kitchenette in this lean-to addition has inadequate bench and storage space. The use of a trolley would facilitate table setting and reduce the number of trips (indicated by lines) which are now necessary.

▲ Buckets or cans are easily moved with the help of a platform on wheels.

▼ A mobile laundry hamper for storing soiled clothes.

made from the servery to the dining room to set the table and one to transport the entire meal from the kitchen. On the return journey when the meal is over unused cutlery, china, and cruets are replaced in the servery, milk is returned to the refrigerator, left-overs are taken to the safe, and the dirty dishes are taken to the scullery.

The trolley remains nearby while washing-up is done; then clean china and silver are returned to the servery. Without the trolley the distance travelled might be three to four times as great.

In smaller kitchens the problem is frequently shortage of bench space. In such cases a trolley makes a convenient counter for serving meals or for holding unwashed dishes when stacking space is inadequate. The diagram on this page shows a typical lean-to scullery with the dining-living room adjacent. The trolley which could have helped so considerably had been sold. Space for serving was almost non-existent and several trips instead of one were necessary to set the table, to carry food from the kitchen, to remove dishes to the sink, and to replace the clean china in the storage cupboard.

In plans of some very modern, labour-saving kitchens a rolling counter is included. It can be rolled to the supply cupboard and the refrigerator, and when the food is prepared rolled to the oven too. After the meal all dishes are wheeled to the sink or dishwasher, washed, replaced on the counter, and returned to storage. A trolley or rolling counter will save double handling when jams or preserves are being made and is useful too for holding supplies while the refrigerator is defrosted.

Many varieties of trolleys are available, but for food service those with a heat-resistant top are the most practical. Laminated plastic is easily cleaned and will withstand compara-

A tray for draining dishes eliminates the need for mopping up the bench.

tively high temperatures. Wheels should be smooth running and kept lightly oiled so that the trolley can be manipulated easily in any direction.

In the Laundry

A laundry trolley is very useful on wash days and saves the back-breaking job of carrying heavy loads of wet washing from the tubs to the drying place. Its height is another useful feature, as bending to lift each garment when clothes are being hung is eliminated.

A mobile hamper for soiled clothes is also an asset, particularly where there is a large family washing. In country homes two such hampers will keep work garments separate from lighter garments, sheets, and towels.

For Buckets and Cans

A small platform built on castors will simplify the task of carrying buckets or garbage cans and in the dairy makes light work of moving loaded milk cans.

Trays

Trays should be selected for their usefulness as well as for their design. As they generally have to be carried, they should be light but firm enough to hold all requirements. Those made from laminated wood which is both heat and stain resistant are particularly useful, light, and durable. They also have a coved, all-round edge which is easy to hold and very simple to clean.

This cupboard occupies very little space, but provides storage for an assortment of trays.

A tray may sometimes take the place of the trolley in table setting, for with its help one trip with all the requirements of napery, silver, and cutlery is sufficient. Individual trays for luncheon or supper parties are a novelty and are more manageable for guests than the buffet type of service.

A drainer tray is a necessity for almost every sink bench, particularly for the type of bench which slopes away from the sink instead of toward it. Unfortunately this type of bench is frequently seen even among the more expensive stainless steel ones and mopping it up after dish washing is an annoying and unnecessary task. When the bench surface is of linoleum or wood and is not impervious to water a tray gives protection to the surface as well as saving the work of drying it.

Trays, large or small, can be stored conveniently in vertical positions and when they are readily accessible will be put to better use than if stacked on a shelf or stored in a cupboard.

Using Resources

A little thought as to possible ways of working with less effort may lead to greater use of trolleys and trays. Both are potential labour savers and are frequently capable of reducing some of the inconvenience arising from a lack of other facilities.

Drying Culinary Herbs

MOST culinary herbs can be so easily dried that there is no reason why anyone with plenty of fresh herbs available should not have a stock to last through the time when they are out of season.

Herbs require different treatment from that given to fruits and vegetables, because most of the flavour in the herbs is in the form of oils in the leaves. The aim is to conserve the oil by drying the leaves without crushing or heating them.

Herbs should be gathered just before they begin to flower, on a dry morning after the dew has evaporated but before the sun has been on them for long. They should be washed to remove any dust and should be shaken thoroughly to free them from droplets of water.

The herbs are then tied in bunches and hung in a warm room out of the sun. The bunches should be loose so that air can reach the centre leaves. Paper may be placed over the tops of the bunches to shield them from dust which might settle on them during the 2 to 3 weeks normally required for successful drying.

The dried leaves are easily separated from the stalks and can be crushed with a rolling pin and stored in small airtight jars, preferably in a dark place.

—*MAUD B. STRAIN,*

Field Officer in Rural Sociology, Department of Agriculture, Dunedin

An Attractive Knitted Cape

A CAPE that will grace both formal and informal occasions is a very useful article for any woman to possess. The elegant cape illustrated at right would be handy on those fine, but chilly evenings. Instructions for knitting the cape are given below.

ABBREVIATIONS: K., knit; p., purl; st., stitch(es); tog., together; rep., repeat; in., inches; patt., pattern; cont., continue; dec., decrease; wl. fwd., wool forward; wl. bk., wool back; sl., slip; p.w., purlwise; p.s.s.o., pass slipped stitch over; beg., begin.

Measurements: Length, 19½in.

Materials: 13oz. double-knitting wool; 4 No. 5 knitting needles; 1½yds. of 1in. ribbon; hook and eye.

Tension: 6 st. and 10 rows to 1in.

The Cape

Using 3 No. 5 needles, cast on 400 st. (100-200-100) and with 4th needle work thus:—

1st row: K. 1, wl. fwd., sl. 1 p.w., wl. bk. to end.

2nd row: P. 1, wl. bk., sl. 1 p.w., wl. fwd. to end.

These 2 rows form the patt. Rep. them for 6in.

Begin shaping thus:—

1st dec. row: Patt. 4, * sl. 1, k. 2 tog., p.s.s.o., patt. 11. Rep. from * to last 4 st., patt. 4. (344 st.)

Work straight for 3in.

2nd dec. row: Patt. 4, * sl. 1, k. 2 tog., p.s.s.o., patt. 9. Rep. from * to last 4 st., patt. 4. (288 st.)

Work straight for 3in.

3rd dec. row: Patt. 4, * sl. 1, k. 2 tog., p.s.s.o., patt. 7. Rep. from * to last 4 st., patt. 4. (232 st.)

Work straight for 3in.

4th dec. row: Patt. 4, * sl. 1, k. 2 tog., p.s.s.o., patt. 13. Rep. from * to last 4 st., patt. 4. (204 st.)

Keeping continuity of patt. work thus:—

Next row: Patt. 41, k. 2 tog., turn, leave other st. on spare needle. Next row: Work 2 tog., patt. to end.

Next row: Patt. to last 2 st., work 2 tog.

Next row: Patt. to end.

Next row: Patt. to last 2 st., work 2 tog.

Next row: Patt. 2 tog., patt. to end.

Rep. last 4 rows until 17 st. remain, finishing at front edge.

Next row: Cast off 10 st., patt. to last 2 st., work 2 tog.

Next row: Patt. to last 2 st., work 2 tog.

Next row: Work 2 tog., patt. 1, work 2 tog.

Next row: Work 3 tog., fasten off.

Go back to st. on needle, slip next 16 st. on st. holder.

Next row: Rejoin wool, work 2 tog., patt. 82, work 2 tog., turn.

Next 2 rows: Work 2 tog. each end.

Next row: In patt.

Next row: Work 2 tog. each end.

Rep. last 4 rows until 30 st. remain.

Cast off.

Go back to st. on needle, sl. next 16 st. on st. holder, and work on other front st. to match. Join on wool to 16 st. on st. holder and work in patt. for 58 rows. Cast off. Work other side to match.

The Neck Border

Cast on 8 st. and work in patt. for 12in. Cast off.

To Make up

Press work lightly on wrong side with a hot iron over damp cloth. Sew shoulder strips into position, then sew on neck border. Face front edges and neck band with the ribbon. Fasten at the back with a hook and eye sewn to the wrong side.

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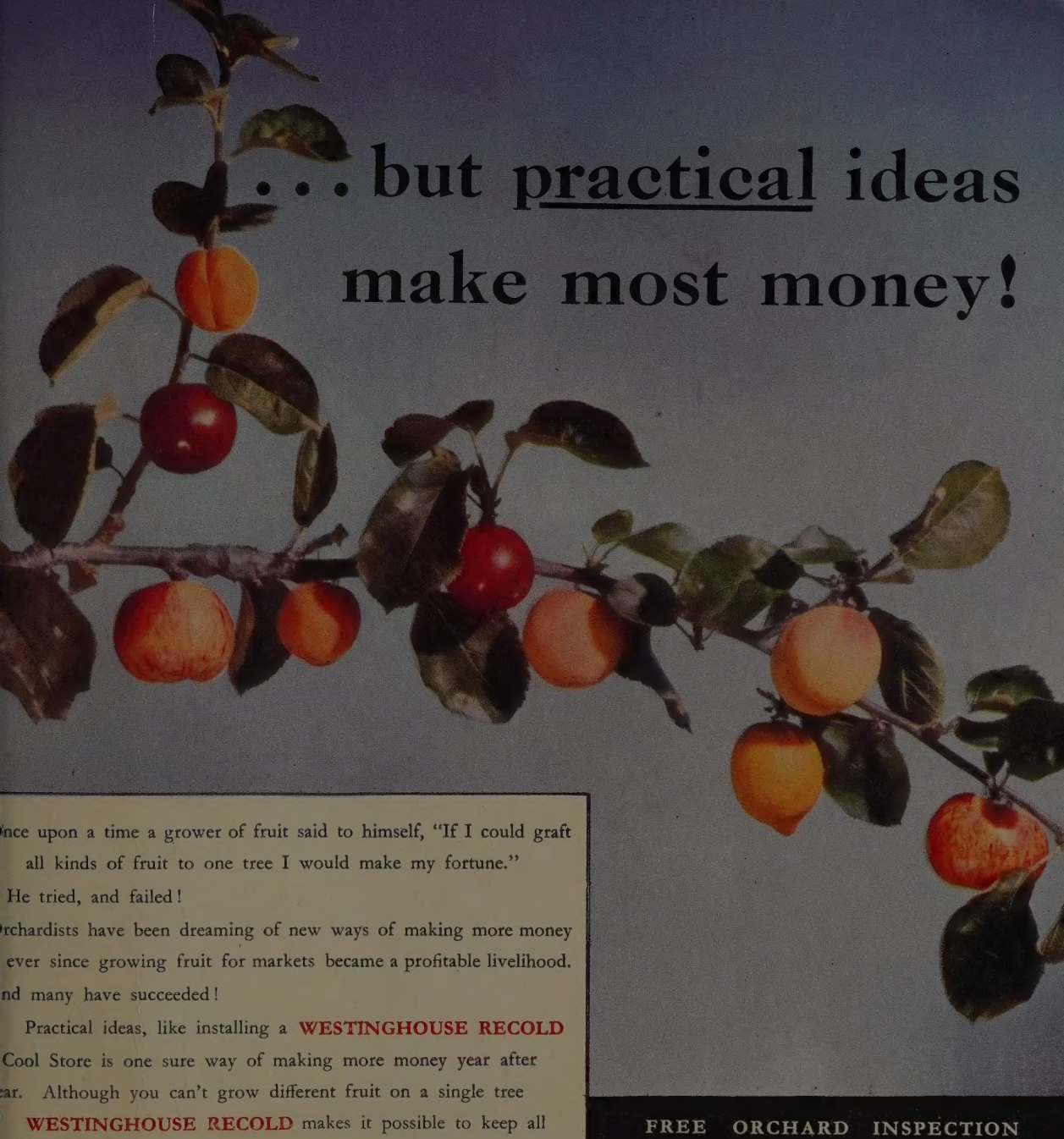

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